Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 66 NEW YORK, SATURDAY, AUGUST 7, 1915 No. 6

The Training of Men

MOST enterprises, whether manufacturing plants, central stations or the business of local dealers, widen under the influence of some individual. He is the man who first sees the opportunity to serve, who knows at first hand what his customers need. He builds a business because he knows intimately all about what he designs and makes and sells. His business grows, and of necessity he loses contact with these intimate problems. Other men become his designing engineers; other individuals remodel what he first made; new points of contact are established by other salesmen for the goods that earlier he himself distributed. Each of these men or group of men becomes a part, but never the whole until each in his turn starts in for himself. The fact that the men who make up the bone and sinew of a modern enterprise cannot feel direct responsibility under ordinary working conditions brings up the need of teaching men within the business the factors that are vital to the success of that business as the man who started it sees them. A man in an enterprise needs, in order to be most useful to it and most successful in it, to know not alone the technique of his end of the work, but something of the broader problems that are involved in company policies and methods. In a public utility the man who comes into contact with the public represents the company's relations. That he should know "why" as well as "how" is most important. Such training properly guided will do much to help solve the many-sided question of public relations.

"Electricity Never Wears Out"

A NEW YORK uncle of a boy scout was finishing his lunch hour lately in a search for an appropriate birthday remembrance for his nephew. At the toy counter of one of the largest department stores in the city he found a pocket electric "bug-light." This little flashlamp was fitted with three bulls'-eyes, one red, one blue and one white, which could be handily slid in turn over the bulb at the end of the lamp. Here was a novelty with an immediate boy-appeal, and this dialogue preceded the purchase: "How long will the battery last?" "Two hours." "Has this battery been in stock long enough to be weaker than a fresh one?" "Oh, no," said the boy clerk. "Electricity never wears out." The writer was an "assistant purchasing agent" in this transaction. He thinks the story worth telling because it strikes deep at one of the problems of distribution which face the electrical manufacturer of appliances of all sorts. The manufacturer, the central-station manager, the dealer in electrical supplies have this question to answer: "Can electrical goods in the long run be sold successfully through retail merchants who have no knowledge of electricity?" On the one hand is the manufacturer, justly seeking the widest distribution possible for his product. Strictly from the viewpoint of increasing sales, he needs more dealers who are merchants. On the other side is the customer, who, perhaps, makes a purchase and because of his own lack of knowledge misuses and blames the equipment he buys. There is only one answer. Either the electrical dealer must wake up and learn how to merchandise or the department-store merchant must reform and learn a few simple lessons in electricity. The question is who will act first. The successful merchandising of electrical appliances over the counter demands action.

Helps to Business

IF the Federal Trade Commission embodies in its permanent practice the suggestions of Vice-chairman Hurley the result will be of constructive benefit to manufacturers and therefore to our national industrial standing. Many manufacturers in the electrical industry will be able to study their own operations more effectively with the co-operation of the commission specialists. The need for better knowledge of cost accounting is as plain to those within the industry as to the new commissioner who is lending his successful experience for the solution of serious trade problems. That price demoralization arises from ignorance of true cost is shown by the competitive relations of every manufacturer to-day. It is reassuring to find the commission considering ways to help instead of ways to hinder business. As a destructive agency it could not be a permanent factor in government, but as a promoter of sound trade practices, correct cost-accounting principles and combination for foreign trade it will be a statesmanlike power which the electrical industry will welcome. The nearer the commission approaches to that ideal, the less will it find its efforts hampered by distrust of its motives or fear to divulge information.

Standardization in Accounting

THE constructive work of standardization in accounting, suggested by Chairman Edwards of the Accounting Section of the National Electric Light Association in his interview in last week's issue of the ELECTRICAL WORLD, is rendered extremely complicated by the lack of uniformity in either company practice or commission order. Companies have co-operated in the

compilation of the standard N. E. L. A. classification, but where they are under commission jurisdiction they are powerless to use it unless it is prescribed by the State authority. The commissions have an organization in the National Association of Railway Commissioners, and this might be an appropriate agency to promote a standard system of accounts for electrical utilities; but so far it has not moved in this direction. When the companies agree upon a standard classification which they are without authority to enforce and a number of the State commissions not only ignore this system but also act with entire disregard of each other, it is plain that standardization is making no progress. Either the association system meets the commission requirements in accounting or it does not. It will not be argued that each one of the various and conflicting State commission accounting systems has a monopoly of the virtues pertaining to this department of central-station responsibility. It is greatly to be desired that the new Accounting Section shall be able to signalize the first year of its work, just begun, by taking definite steps, in co-operation with public authorities, toward final standardization.

The Laws of Induction

It was demonstrated by Faraday that when a wire was moved across a magnetic field so as to cut the magnetic flux an electromotive force was induced in the wire during the motion. Faraday also demonstrated that if a loop of wire is linked with magnetic flux any change in the linkage, due either to motion of the loop or to motion of the flux, sets up a temporary electromotive force in the loop. Ever since that time there has been a difference of opinion between electromagneticians as to the manner in which these phenomena should be regarded. Some declared the fundamental law to be that whenever a loop has its flux contents changed in any manner there will be a generation of electromotive force, and the primordial idea is that of a circuit loop. Any cutting of flux by a conductor is therefore a mere case of altering the flux in the loop circuit to which it belongs. Others took the opposite view and contended that a loop is a mere series aggregation of conducting elements, the primordial idea being that of the cutting of flux by some of these elements. It is true that when cutting is effected in this way there will be a change of flux in the circuit, but that is a consequence and not a cause of the electric action. So the loopers and the cutters carried on an animated intellectual warfare, each side declaring that the other side set the cart before the horse. There is a large literature on this peaceful war. In the great mass of engineering dynamo phenomena it was a matter of complete indifference, from a practical point of view, which opinion was held. There was nearly always both a looping action going on, to satisfy the loopers, and also a cutting action going on, to content the cutters. Nevertheless, from an intellectual standpoint, each saw the universe of the other as inside out.

Of recent years, however, the evidence has been accumulating on the side of the cutters. It has been pointed out, for example, that if a loop full of magnetic flux was suddenly injected into a circuit loop, without any flux cutting, and merely by switching at some point of contiguity, no electromotive force was generated in the circuit, and yet flux was being inclosed in a new loop. Blondel recently demonstrated by a series of experiments that when loops are changed in flux contents by tangential motion, as distinguished from motion which cuts, no perceptible electromotive force is generated. This is another blow for the loopers.

Looked at from the standpoint now reached after seventy years of debate, it would appear that no electromotive force can be induced in a circuit unless flux cuts the boundary. "No cuts, no volts," is the day's password. Furthermore, this slogan means, if it is to be trusted, that when a secondary coil lies outside of a primary coil, as, for example, when we apply first a primary and then a secondary winding to a laminated ring core, the flux which traverses the core when the primary winding is energized does not spring up and develop within the primary coil, but comes jumping through the secondary coil from outside, so as to cut the secondary wires. Let us hope that the loopers will finally admit that their loops are cut, and find other fields to occupy their honest and valuable warlike activities.

The Central-Station Man in the Community

Those who have followed the rise of electrical supply to its present position of importance have been brought to realize fully the change that has come over its relations to the community. In the old days, when the whole art consisted of the exploitation of systems under the general principle of charging what the traffic would bear, the central-station man was looked upon as a predatory innovator whose goods must be purchased as a modern improvement, paid for with due grumbling, and criticised to balance the account. Those who can remember the early struggles in establishing electric lighting appreciate the difficult position in which the central-station manager stood in the community—his efforts to make apparatus far from perfect do its work and to wring a favorable balance sheet out of his operating expense and repair account. Time was when he was eyed askance by the town fathers as one who had saddled them with costly goods and rejoiced that public opinion compelled their purchase. How far the present has left behind this unhappy past our readers well know, but even now few of them appreciate fully the changed attitude of the managers of public service corporations and the extent to which they are willing to go in lending a hand in public improvements and in "taking a chance"—sometimes a gambler's chance—in the continuing prosperity of the people. Even public lighting, once looked upon as a necessary and congenial form of graft, has now settled itself on a businesslike basis, and, little as the public may realize the fact, many a central-station manager regards public lighting as a branch of

service in which it is his duty to give the most he can for the money and to reckon his costs on a rigid basis of public economy.

And this is only the beginning of the proper relation of the central-station man to his public. One of the wisest and most successful of all managers once very shrewdly remarked: "Every time I have decreased my prices I have increased my net profits." The truth of this statement is being brought out by the fact that electrical service is the one product of which the price has been steadily reduced in face of rapid increase in the cost of all other necessary commodities. This matter of prices takes care of itself automatically, but there is room for still further co-operation with the public. The central-station manager in any community should be of right its trusted adviser in all technical matters which have even remotely to do with electrical service. He should put himself in such a position that he will be instinctively trusted as one looking after the interests of his fellow citizens as well as his own. As a matter of fact, these interests are identical. If the coming of a factory means benefit to the city in general, it should also mean added prosperity for the electrical plant, and steps should be taken at once to supply the factory with electrical service. If improvements in the water service are to be made, there is an excellent chance that electrical pumping can save money for the community and earn it for the central station. If business is booming, the streets and shops need to be better lighted since light is one of the cheapest forms of efficient advertising. It is the chief business of the central-station man to make his goods a necessity rather than a luxury, and if he works steadily at it this can be brought to pass.

Every project of public betterment should find the manager at the front with this object in view and ready to lend a hand as far as is practicable. He must run risks now and then, as do other business men, in trusting to future growth for his profits. If plans are being made for the development of a new section of the city, he must be in at the start and ready to co-operate in seeing that no building is erected unwired for electric service, that no factory starts without a demonstration that motor service is to its advantage. The prosperity of the business demands that it keep in the closest possible touch with every form of improvement and establish a reputation for being "on the job" that will make the manager's advice and co-operation sought as a matter of course when any public benefit is under way. The trend of the last few years has been steadily in this direction, and it is going to continue until the local electric plant is looked upon as a center of civic activity. To-day the manager of a central station is likely to be a well-trained and well-educated man, fully able to take a strong personal hold on the community and assist in its technical activities, just as he must be capable of following up those in his own special line of work. It is the policy of getting close to the best that is in the community which will ultimately win. First, last and always the central-station man must be an energetic and public-spirited citizen.

The Reserve Plant at Springfield, Mo.

In the valuation of the electric utility at Springfield, Mo., last year the Missouri Public Service Commission disallowed the item of a reserve steam plant. It held that the plant was not required and that the public should not be obliged to pay a return on its value. It based a rate-making order on an appraisal which rejected this plant as "used or useful" and indicated its implicit belief that a continuous supply of energy would be obtained from the hydroelectric plant belonging to the Ozark Power & Water Company or from a steam plant at Joplin, Mo. Although the United States District Court has enjoined the commission from enforcing the reduction in rates which it ordered and the case is therefore evidently to have final adjudication in the courts, it is a matter of great interest that the plant which the company declared was justifiable as a reserve has been a useful resource in a number of recent emergencies. According to our advices, the transmission line from the hydroelectric plant was damaged recently and the Joplin plant could not supply sufficient energy for even the electric railway in Springfield. The reserve plant has been maintained in readiness for operation and it provided for the full needs of the city.

This is a case where, in a legal sense, the reserve plant had been disposed of by commission order. Since the commission held that the reserve plant had no value on which the company could earn a return, it was as if it did not exist as a tangible element. During the trial of the case before the commission the attorneys who attacked the schedule said that they would prefer to be without service occasionally rather than to pay rates based on a valuation including the reserve plant. They could make that grandiloquent renunciation safely, because they thought that service interruptions would be immaterial, if, indeed, any took place. The steady supply of service, the necessary and expensive precautions to prevent interruption and to avoid complaints from consumers, meant nothing; those were the affair of the company to settle in any way it could. In yielding to these representations the commission only destroyed the value of the plant as an element in its order, it did not demolish the physical unit. When the continuation of service was threatened the reserve plant met the emergency.

The pending contest of the decision in the courts and the retention of the plant create a situation which benefits consumers. Because of the unwillingness of the company to lose its investment in the plant and the prompt appeal to the courts, the order of the commission came very near to both giving rates which did not take the reserve apparatus into account and at the same time affording consumers the protection which their representatives argued they could do without. It was like getting the benefit of the plant without paying for it. However much this doctrine may appeal to some consumers, it is one that has never been upheld by the courts or the sober judgment of the people when they know the facts.

RESIGNATION OF DR. McALLISTER

Staff of Electrical World Tenders Farewell Luncheon to Him—Mr. F. M. Feiker Chosen as His Successor

The editorial staff of the ELECTRICAL WORLD gave a luncheon Friday in the Engineers' Club, New York, in honor of Dr. A. S. McAllister, who withdrew as editor on Aug. 1. Other members of the McGraw Publishing Company, from the staffs of the *Electric Railway Journal*, the *Engineering Record, Metallurgical and Chemical Engineering* and the *McGraw Electrical Directory*, also joined in paying their respects to the guest of honor. Mr. Hugh M. Wilson, first vice-president of the McGraw Publishing Company, acted as toastmaster, and speeches were made by former associates of Dr. McAllister on the ELECTRICAL WORLD.

Dr. McAllister was taken somewhat by surprise when the staff, through Mr. William H. Onken, Jr., managing editor, presented him with an inscribed gold watch.

Dr. McAllister's Work on the Electrical World

Mr. Wilson before announcing the various speakers dwelt on those personal qualities of character possessed by Dr. McAllister which won him the high regard of the staff. He told of the contributions made by Dr. McAllister to the dignity, reliability and standing of the ELECTRICAL WORLD during his ten years' connection with its editorial department and said that his services would still be available to the company in a consulting capacity. No changes in general policies are contemplated, and Dr. McAllister's work, he said, will fall into the experienced hands of Mr. F. M. Feiker, who has been chosen to succeed him. Mr. Wilson expressed satisfaction at being able to assure to the new editor the hearty and undivided support of the staff which has been so loyal to Dr. McAllister. It is one of the evidences that mark both the high character of the individuals and the substantial nature of the ELECTRICAL WORLD as an institution.

After a toast drunk to the health of Mr. James H. McGraw, who is now on the Pacific Coast, Mr. Wilson presented Mr. Onken, who on behalf of the staff said:

Felicitations of the Staff

"It is difficult to express adequately in words the esteem in which his associates hold their former chief, Dr. McAllister. In an institution like the ELECTRICAL WORLD the paper must always transcend in renown and importance the personality of its editors. Every great journal is endowed with an individuality so strong that none may venture to match against it his own. Publications now are sponsor for all that they contain, and subordination of self is one of the essential attributes of an editor.

"Indeed, an editor's life makes no noise; it has no fever, no exhalations, no tumultuous joy. No delirious crowds distract it with fickle applause. It glides calmly through quiet years, touching all other lives that fall within the range of its influence with a pervasive beneficence that at last enshrines it in the admiration of all readers, and especially in the love of those humbler servants who have labored beside their chief.

"This, after all, is the summation of his reward. Is it not enough? Does it not satisfy the cravings of the soul? What are the glittering and empty triumphs of ambition compared with the abiding consciousness of a lodgement in the hearts of men?

"Of Dr. McAllister it is not necessary for me to speak. He has gone in and out among us, affording us abundant opportunity of observing him. Every day he has added to the measure of our respect, to the extent of our admiration, and to the depth of our obligation. And now, as he withdraws from among us, we have embraced the opportunity of presenting to him this watch as an expression of our esteem. In it are engraved these words:

ADDAMS STRATTON MCALLISTER,
with the affectionate regards
of his associates on the
ELECTRICAL WORLD,
1905-1915.

Freely may we offer now this tribute of our affection for all those personal traits of character which have so endeared him to us, our admiration for the pure and lofty purposes which have animated his career, our gratitude for his faithful, unwearied devotion to the best traditions of the ELECTRICAL WORLD.

"It remains for us, Doctor, but to wish you godspeed. May your life be long; may it be prosperous, unclouded by sorrow or anxiety, except as the memory of former scenes and friends may temper the sunshine of universal approval under which in honor and in peace it rolls its course to the Great Beyond."

Response of Dr. McAllister

Voicing his thankfulness for the gift and especially his appreciation of the spirit which prompted it, Dr. McAllister alluded to his work on the ELECTRICAL WORLD and to the very cordial relationships which grew up between him and the members of the editorial staff. With keen regret, he said, did he look upon the severance of those charming ties knit so closely by daily personal contact, and he asked that the same measure of co-operation he enjoyed be extended to his successor, Mr. Feiker. Editorial work Dr. McAllister always found pleasant and to his liking, and the publishers of the ELECTRICAL WORLD, he said, were ever more than generous in outlays for editorial development. He was glad that as a consulting editor he would not lose entire touch with his former associates and expressed the hope that the paper would continue to grow in strength and importance as the dominating interpreter of the electrical industry.

Mr. Feiker Outlines Policy

Mr. F. M. Feiker was then introduced and spoke in part as follows: "The ELECTRICAL WORLD is the voice of an industry. That industry is made up of many parts. Often men in one section of the industry forget that there are other sections, and that the success of all depends on the interrelations and the co-operation of one with the other.

"The ELECTRICAL WORLD has led and reflected the industry as a whole with a saneness and fair-mindedness that have given it its place to-day in the industry. As Mr. Onken has so well stated, an institution like the WORLD comes to have an entity of its own. Its editors become interpreters, and my only wish in taking up the responsibilities that have been so ably carried by the men who have preceded me is to interpret the electrical industry as I see it to-day in the same spirit of truth and service that they have sought and given."

Career of Dr. McAllister

Addams Stratton McAllister was born at Covington, Va., Feb. 24, 1875. Following preliminary schooling in his home town of Covington, he entered Pennsylvania State College in 1894, from which in 1898 he received the degree of B.S. and subsequently the degree of E.E. Prior to graduation, several summers were spent in machine-shop and field-surveying work. In 1898 and 1899 he gained experience in electric-locomotive opera-

tion and repair at mines near Windber, Pa., and the next year studied practical manufacturing details of direct-current and alternating-current machinery at the Westinghouse works at East Pittsburgh, Pa.

Completing a post-graduate course in electrical engineering at Cornell University in 1901, he received the degree of M.M.E., and in 1905 was granted the degree of Ph.D. From 1901 to 1904 he was instructor in physics and applied electricity at Cornell, and in 1904 he was assistant professor of electrical engineering there.

In 1905 Dr. McAllister joined the staff of the ELECTRICAL WORLD as associate editor, and, following the resignation of Mr. W. D. Weaver, he was in 1913 appointed editor-in-chief of the paper. Since 1909 he has also served as professorial lecturer at Pennsylvania State College and has lectured before many engineering and electrical organizations throughout the country.

DR. A. S. McALLISTER

Dr. McAllister was the first to expound and formulate the application of the law of conservation in illumination calculations, and he developed the simplified circle diagrams of single-phase and polyphase induction motors and synchronous motors and the absorption-of-light method of calculating illumination. He received patents for alternating-current machinery in 1903, 1904, 1906 and 1907.

He is the author of "Alternating-Current Motors," used as a textbook in many leading engineering schools, and of chapters on "Transformers" and "Motors" in the "Standard Handbook for Electrical Engineers." He has also contributed to the technical press numerous original articles on engineering subjects resulting from original investigation and research.

Dr. McAllister is the president of the Illuminating Engineering Society and a Fellow and a member of the board of managers of the American Institute of Electrical Engineers. He is a member of the American Association for the Advancement of Science, the American Electrochemical Society, the National Electric Light Association, the New York Electrical Society, the Society for the Promotion of Engineering Education, the Jovian Order, the Pennsylvania State College Association of New York, the "Virginians" of New York, the New York Southern Society, the Virginia Historical Society, the Cornell University Club of New York, the University Club, State College, the Sigma Xi and Tau Beta Pi honor societies, the Phi Kappa Phi honor fraternity, and the Eta Kappa Nu electrical fraternity.

Mr. F. M. Feiker

Mr. F. M. Feiker, who succeeds Dr. McAllister as editor of the ELECTRICAL WORLD, has for the last three years been chairman of the editorial board of the A. W. Shaw Company, Chicago, publisher of *System*, *Factory*, and books on business. Born in 1881 at Northampton, Mass., Mr. Feiker was in 1904 graduated from the electrical engineering course of Worcester (Mass.) Polytechnic Institute, and spent the following year in special research work on high-potential generation and transmission as private assistant to Prof. H. B. Smith of Worcester.

During the year 1906-1907 Mr. Feiker served as technical journalist for the General Electric Company. Joining the staff of *Factory* magazine at Chicago in 1907, he was appointed technical editor, and in 1909 managing editor. In the latter position he continued until 1912, when he was made chairman of the editorial board of both *Factory* and *System*, which post he held until his resignation to join the staff of the ELECTRICAL WORLD.

In 1912 Mr. Feiker delivered at Harvard by invitation a course of lectures in industrial organization. He is an associate member of the American Society of Mechanical Engineers and of numerous organizations for the advancement of science, education and management. He is a member of the Engineers' Club, New York City, the University Club, Chicago, and the City Club, Chicago.

Government Reports on Hydroelectric Development

Information regarding hydroelectric development in foreign countries which has been secured by the Department of Commerce covers installations of varying sizes in Bahia, Brazil; Stavanger, Norway; Gothenburg, Sweden; Seville, Spain; Zanzibar, Africa, and Tamatave, Madagascar.

The data were obtained by American consular officers and cover many matters connected with hydroelectric properties, such as the Swedish Water Power Association, the Swedish Electric Works Association, trade in electrical materials, methods employed by Germany in building up a market for electrical apparatus and supplies in Russia, and possibilities for extension of the trade of American manufacturers of electrical materials in Madagascar.

The reports, which are in manuscript, were at the New York office of the Bureau of Foreign and Domestic Commerce for some time and were inspected with interest by persons seeking information on the subject. They were then sent to Newark.

The reports will be in the following cities: Boston, Aug. 9 to 14, branch office of Bureau of Foreign and Domestic Commerce; Pittsfield, Mass., Aug. 16 to 20, Board of Trade; Philadelphia, Aug. 23 to 27, Commercial Museum; Pittsburgh, Aug. 30 to Sept. 4, Foreign Trade Commission; Rochester, Sept. 7 to 10, Chamber of Commerce; Buffalo, Sept. 13 to 16, Chamber of Commerce; Cleveland, Sept. 18 to 22, Chamber of Commerce; Cincinnati, Sept. 24 to 28, Chamber of Commerce; Sept. 29 to Oct. 2, Cincinnati, New Orleans, Texas & Pacific Railway; St. Louis, Oct. 4 to 9, branch office of Bureau of Foreign and Domestic Commerce; Atlanta, Oct. 12 to 16, branch office of Bureau of Foreign and Domestic Commerce; New Orleans, Oct. 18 to 22, branch office of Bureau of Foreign and Domestic Commerce; Los Angeles, Oct. 28 to Nov. 3, Chamber of Commerce; San Francisco, Nov. 6 to 13, branch office of Bureau of Foreign and Domestic Commerce; Seattle, Nov. 16 to 20, branch office of Bureau of Foreign and Domestic Commerce.

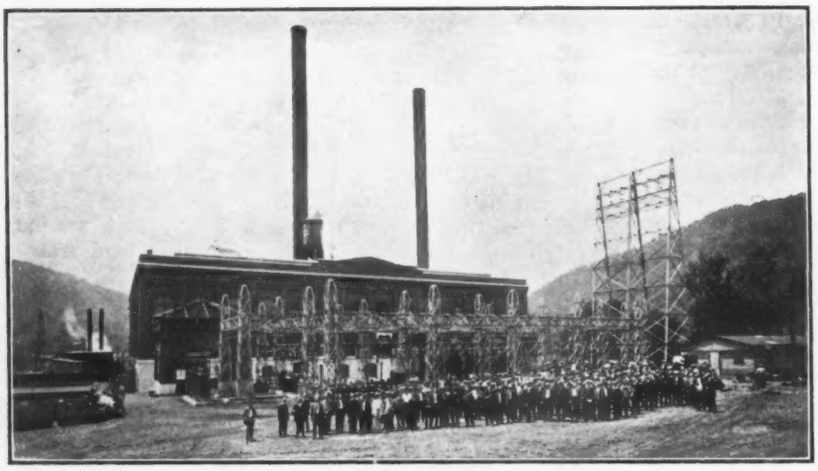


FIG. 1—ENERGY GENERATED AT THIS POINT IS TRANSMITTED TO A GROUP OF COAL MINES WITHIN A 50-MILE RADIUS

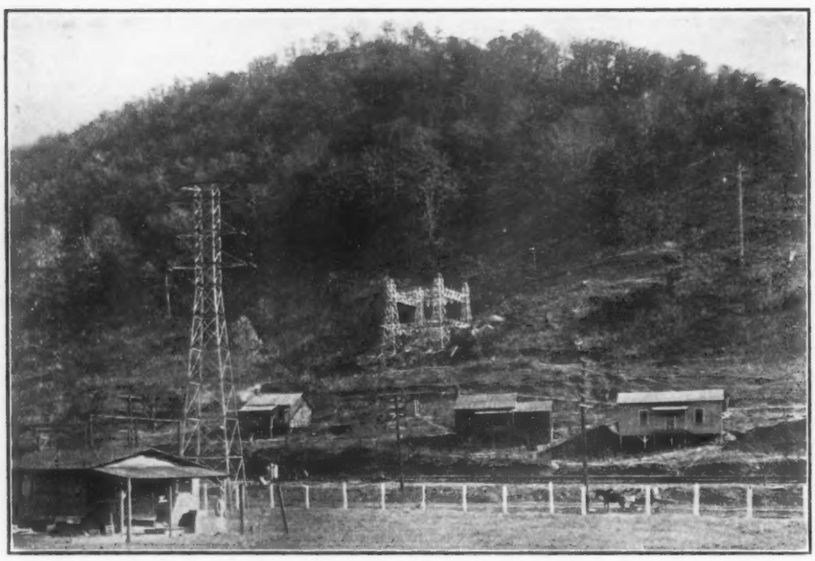


FIG. 2—SWITCHING STRUCTURE ON MAIN TRANSMISSION LINE FROM WHICH LINES BRANCH TO DIFFERENT MINES

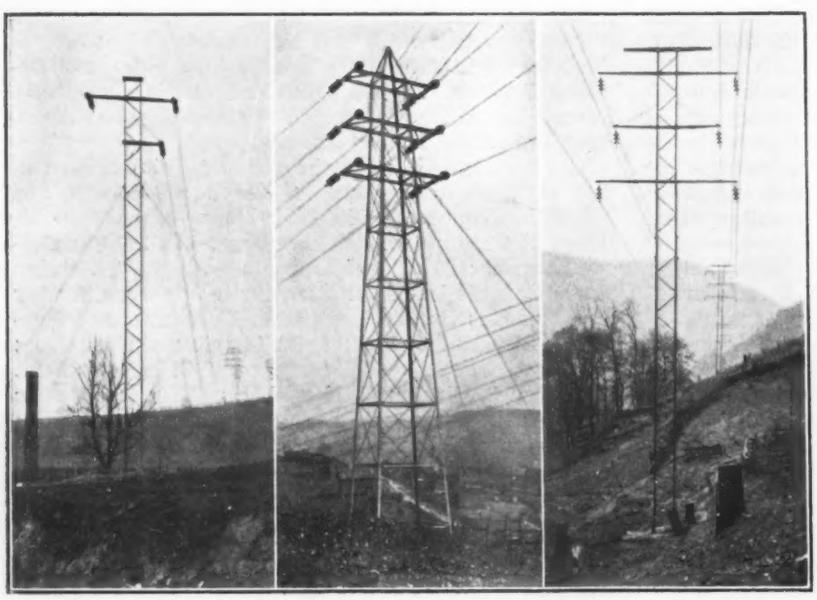


FIG. 3—TYPES OF TRANSMISSION-LINE STRUCTURES CARRYING SINGLE AND DOUBLE 44,000-VOLT CIRCUITS

One Boiler Room

Second of Two Articles of the Virginia

THE engineering details of the 20,600-kva. steam plant of the Virginia Power Company, which serves some fifty coal mines in the Kanawha and New River coal fields of West Virginia, were presented in last week's issue of the ELECTRICAL WORLD. In what follows a pictorial description is given of the transmission lines and substations from the steam station to the mouth of the coal mines, showing the features of engineering construction that have been devised to serve this class of customer economically from a transmission system operating at 44,000 volts. Following these illustrations, the design details and data relating to these transmission lines and customers' substations are presented.

Instead of the high-tension apparatus being housed in the steam-station building according to the usual design of steam stations used in connection with a transmission system, a modern outdoor substation type of structure has been built which is one of the largest outdoor high-tension transformer plants entirely operated in connection with a steam generating station. As shown in one of the accompanying illustrations, this outdoor substation is situated just outside the station turbine room. It is a steel-frame structure, arranged for accommodating twelve 2750-kva. single-phase water-cooled, oil-insulated outdoor-type transformers with bus arrangements and all the auxiliary high-tension apparatus, such as circuit-breakers, choke coils, disconnecting switches, electrolytic lightning arresters, and the like. The buses installed are of brass tubing 1 in. in outside diameter, supported on suitable designs of insulators and sectionalized by outdoor horn-gap switches. The oil switches are of the Westinghouse type of 300-amp. rating.

The diagram of station circuits shown in Fig. 7 indicates the arrangement of low-tension and high-tension apparatus in the station and at the outdoor substation. The low-tension arrangement includes the use of unit buses and a transfer bus. The generators have their neutrals interconnected and grounded. The diagram shows the ultimate station equipment of four turbo-generators. Only No. 1 and No. 2 units have been installed. The layout of the outdoor substation provides for the two additional generating units with the necessary switchgear.

Instead of Fifty

on the Cabin Creek Plant
Power Company

In connection with the transmission system there are no main or central distributing substations, the 44,000-volt transmission lines leading directly from the outdoor substation at the steam station to the customers' substations. From the customers' substations when situated away from the mines short 2300-volt lines are run to the mouths of the mines where the energy is used. There are 156 miles of 44,000-volt and 29 miles of 2300-volt lines.

The main transmission line leads from the Cabin Creek Junction steam station to West Raleigh, a distance of 46 miles. This line is sectionalized at four division points so that in case of trouble the whole length of the main line need not be put out of service. The towers used on this main line are of the square-base windmill type and carry two circuits. The branch circuits taken from the main line are also carried on steel structures. These are for the most part of the Archbold-Brady semi-flexible type of lattice steel poles with square windmill-type anchor towers used every half mile. The conductors carried on these towers are arranged in a vertical plane and supported by Thomas suspension insulators consisting of three disks in suspension and four for strain. On the main line two galvanized 0.375-in. steel ground cables are carried above the conductor cross-arms. The main-line conductors are of No. 000 copper and the branch-line conductors of No. 2 copper.

Transmission-Line Towers

The steel towers used on the transmission line are of three designs of square-base, double-circuit windmill construction, known as A, B and C. The A design of tower was used on the straight runs of line where angles were not more than 5 deg. The B design, which is somewhat heavier, is used for angle and strain towers. These towers were designed to withstand strains due to 8 lb. per square foot wind pressure and 0.5 in. coating of ice. The A design is 11 ft. square at the base, 63 ft. high from ground to ground wire at the top, and weighs approximately 5100 lb. The B design is 20 ft. square at the base, 62 ft. high from the ground to the ground-wire cross-arm at the top, and weighs approximately 6280 lb. The weights given include the anchorage, which was made of steel grillage buried in the earth. The C design of tower

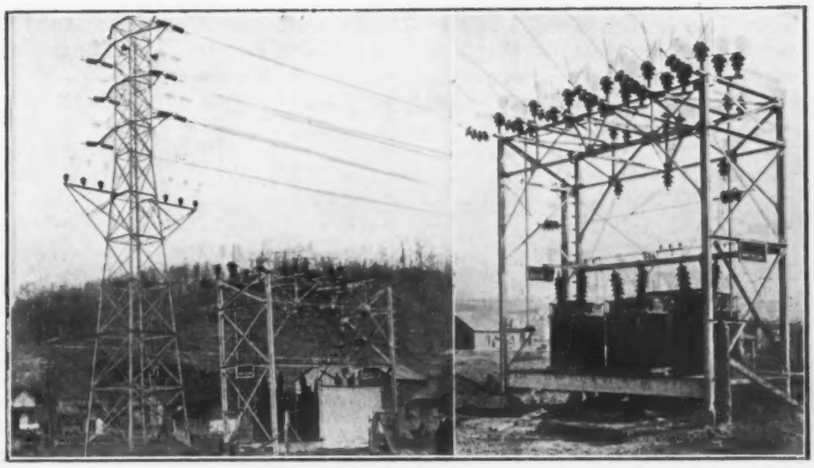


FIG. 4—TYPICAL MINE SUBSTATION, SHOWING TAKE-OFF BRACKETS AND STANDARD STEEL FRAME FOR DEAD-ENDING LINES

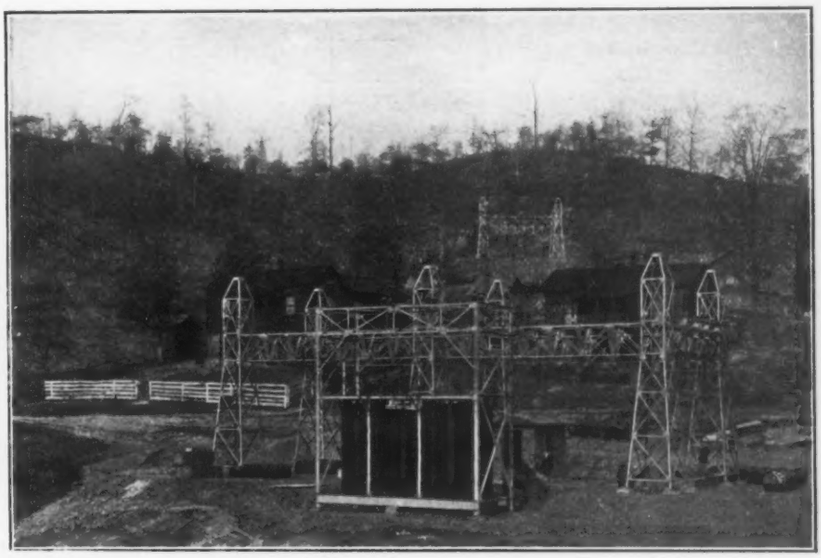


FIG. 5—ANOTHER DETAIL OF THE DISTRIBUTION SYSTEM, SWITCHING STRUCTURE IN DISTANCE, METERING FRAME IN FOREGROUND

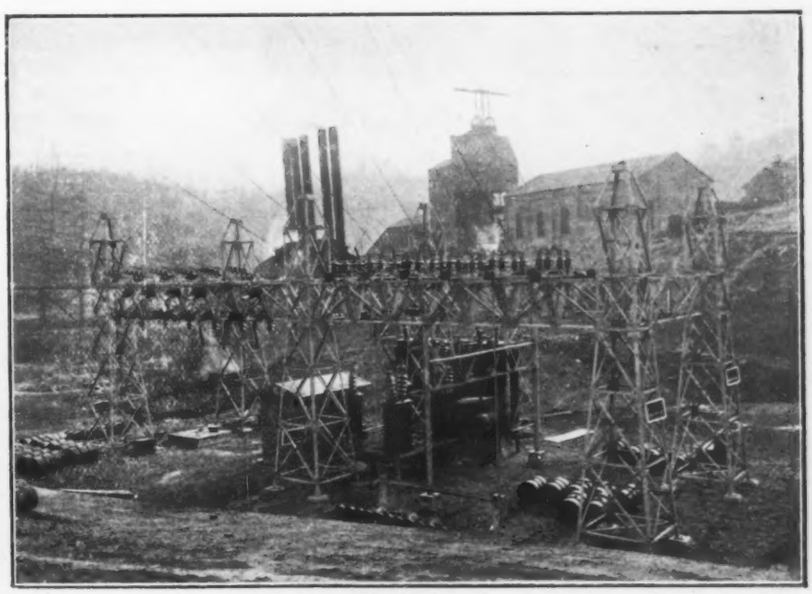


FIG. 6—AN OUTDOOR SUBSTATION AT SCARBRO, W. VA., MINE TIPPLE IN THE BACKGROUND

is used on branch circuits and is similar to designs A and B, with the exception that it carries only one ground wire at its apex. The cross-arms for all of the towers are arranged with a vertical spacing of 6.5 ft.

main and the branch circuit lines by the use of take-off brackets in the manner shown in the top illustration on page 287.

The transmission lines cross navigable rivers in four

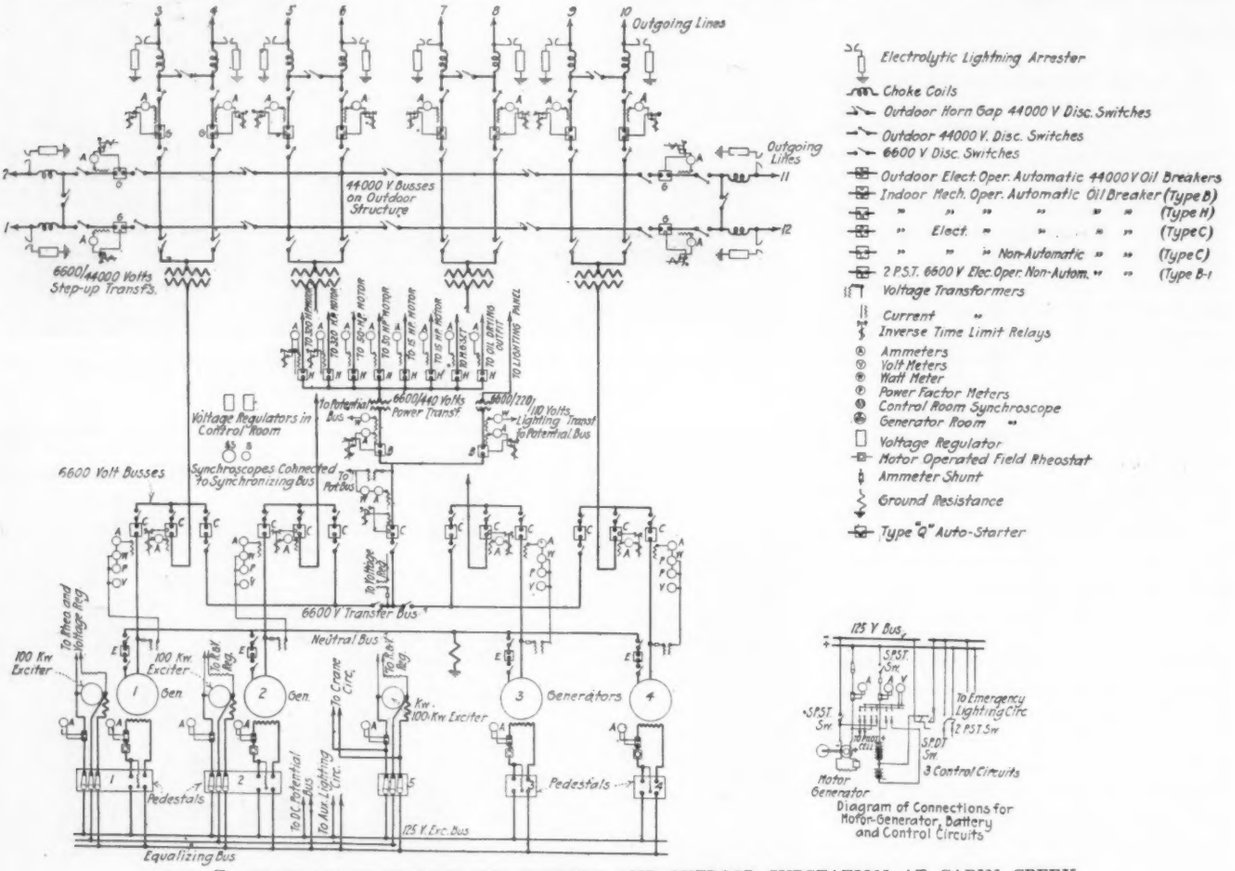


Diagram of Connections for Motor-Generator, Battery and Control Circuits

FIG. 7—DIAGRAM OF WIRING FOR STATION AND OUTDOOR SUBSTATION AT CABIN CREEK PLANT OF VIRGINIA POWER COMPANY

The A and B designs of towers provide a cross-arm at the top for two ground wires, the cross-arm being 12 ft. long. The top and bottom conductor cross-arms are 18 ft. long and the middle cross-arm 14 ft. The C design of tower has a base 10 ft. square and weighs 4220 lb. with anchorage. The middle cross-arm is 18 ft. long and the upper and lower cross-arms are 14 ft. each. The average spacing employed in the case of all towers is 500 ft.

The distribution branches are led off from both the

places, calling for eight river-crossing towers designed and constructed after specifications furnished by the United States War Department. The type of structure is shown in Fig. 12. These river-crossing towers vary in height from 80 ft. to 103.5 ft., and vary in weight from 18,000 lb. for the single-circuit designs to 57,000 lb. for the double-circuit designs. The conductors used for these river crossings are 11/16-in. copper-clad steel with 3 7/16-in. steel ground cables. The insulators supporting these conductors are connected to the river-crossing

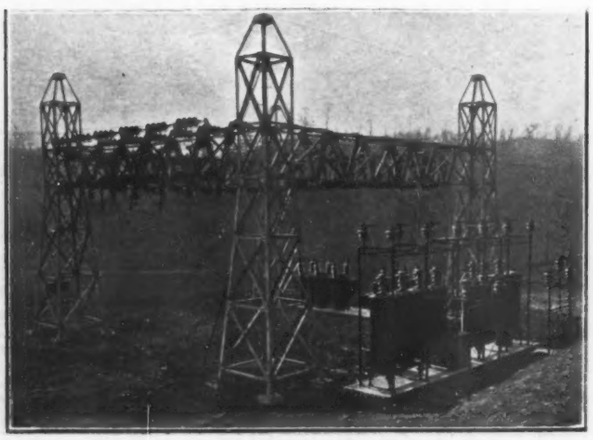


FIG. 8—TYPE OF SWITCHING FRAME USED ON MAIN TRANSMISSION LINE

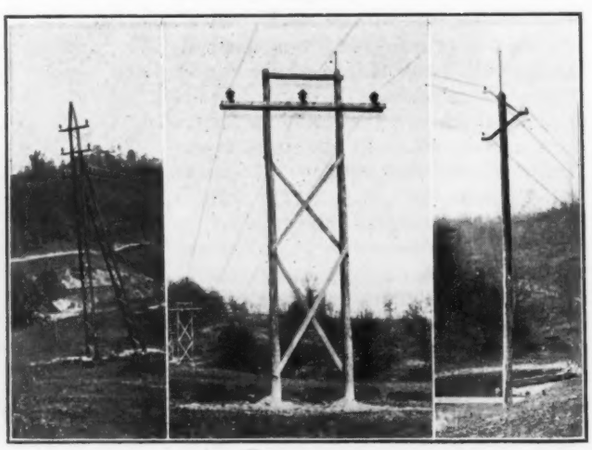


FIG. 9—ARCHBOLD-BRADY JACK AND WOOD-POLE CONSTRUCTION USED ON BRANCH LINES

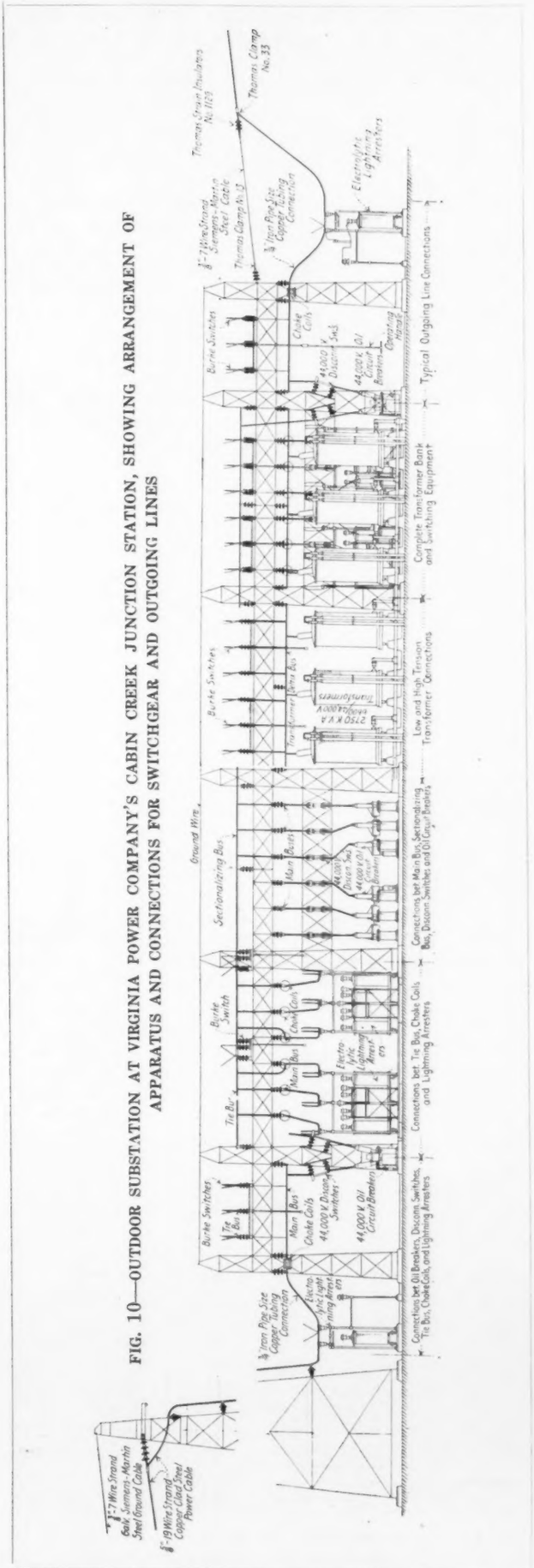

Thomas Strain Insulators No. 1129
Thomas Clamp No. 33
Thomas Clamp No. 32
Electrolytic Lightning Arresters
Burke Switches
Choke Coils
44,000 V. Disconn. Sws.
44,000 V. Oil Circuit Breakers
Operating Handles
Typical Outgoing Line Connections
Complete Transformer Bank and Switching Equipment
Low and High Tension Transformer Connections
Transformers
Ground Wire
Sectionalizing Bus
Burke Switch
Tie Bus
Main Bus
Main Buses
Electrolytic Lightning Arresters
Connections bet Main Bus, Sectionalizing Bus, Disconn. Switches, and Oil Circuit Breakers
Connections bet Tie Bus, Choke Coils and Lightning Arresters
Connections bet Oil Breakers, Disconn. Switches, Tie Bus, Choke Coils, and Lightning Arresters
3/4 Iron Pipe Size Copper Tubing Connection
7 Wire Strand Siemens-Martin Steel Ground Cable
19 Wire Strand Copper Clad Steel Power Cable

FIG. 10—OUTDOOR SUBSTATION AT VIRGINIA POWER COMPANY'S CABIN CREEK JUNCTION STATION, SHOWING ARRANGEMENT OF APPARATUS AND CONNECTIONS FOR SWITCHGEAR AND OUTGOING LINES

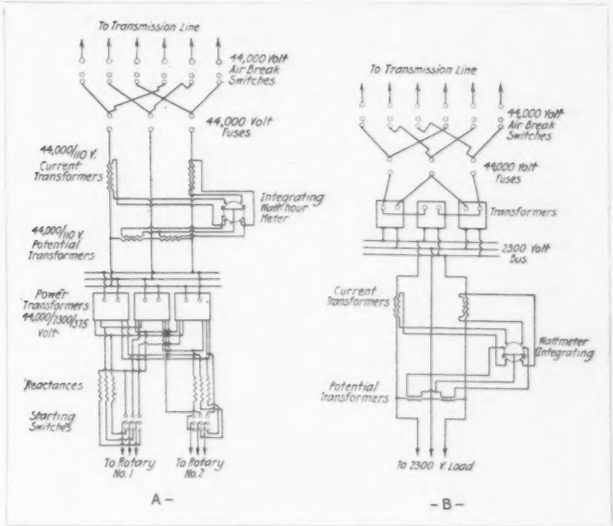


FIG. 11—METERING CONNECTIONS FOR MINE SUBSTATIONS

towers by means of special forged-steel strain clamps. The arrangement of conductors is in a horizontal plane.

The territory through which the transmission lines pass is mountainous and considerable difficulty was experienced in building the various lines. On account

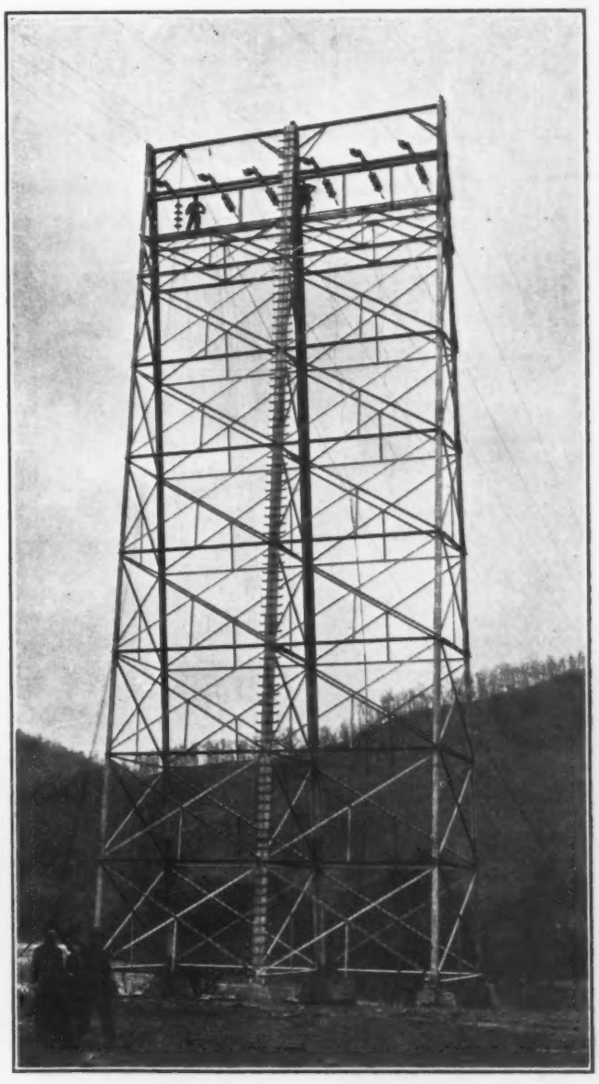


FIG. 12—ONE OF FOUR RIVER-CROSSING TOWERS

TABLE I—TRANSMISSION LINES

44,000-VOLT		2000-VOLT	
Name	Miles	Name	Miles
Power house to West Raleigh	46.8	Decota-South Carbon	1.0
Cabin Creek Frame-Leewood	10.4	South Carbon-Belle Clare	0.4
Leewood-Decota	4.3	Decota-West Virginia Collieries	2.2
Leewood-Kayford	4.4	Empire-Red Warrior	0.5
Ronda-Milburn	16.6	Empire-Acme Power House	0.8
Belmont extension	1.2	Kayford-Shamrock	0.7
Tomsburg-Elk Ridge	2.6	Kayford-United	1.4
Shrewsbury-Winifrede	8.7	Kayford-Raccoon	0.5
Cedar Grove-Putney	6.4	Ohley-Davis Mine	0.6
Smithers-Gamoca	8.0	Sharon substation-Horton Mine	1.1
Scarbro-Winona	14.1	Oakley substation-Oakley Mine	0.4
Nuttallburg Branch	1.5	Ronda-Coalburg Collieries	0.8
Rock Lick Branch		Ronda-Dry Branch	0.5
Sun-Weirwood	4.8	Belmont-Black Cat Mine	1.0
Scarbro-Lochgelly	5.1	Mucklow-Scranton	0.2
Scarbro-Macdonald	4.3	Mucklow-Paint Creek	0.3
Scarbro-Prudence	3.5	Wacomah substation-Wacomah Mine	1.5
Prosperity-Mabscott	3.9	Tomsburg-Greenbrier	0.6
London-Chesapeake Mine	2.0	Milburn Spur	1.1
Raleigh-Winding Gulf	7.8	Ward-Mine No. 1	2.8
		Gamoca-Vanetta	2.6
		Gamoca-Wyndal	2.0
		Gamoca-Midvale	1.3
		Nuttallburg-Blume	2.2
		Nuttallburg substation-Nuttallburg Mine	0.5
		Minden substation-Bore Hole No. 1	0.8
		Minden substation-Bore Hole No. 2	0.7
		Pemberton Spur	0.6
		Power house-Lewis Collieries	0.4
		Winona-Smokeless	1.1

TABLE II—TRANSFORMER SUBSTATIONS

No.	Location	Kva. Rating
1	Mucklow	450
2	Ward	300
3	Carbondale	450
4	Putney	450
5	Gamoca	750
6	Nuttallburg	300
7	Winona	300
8	Scarbro	1800
9	Whipple	900
10	Lochgelly	1800
11	Harvey	600
12	Collins	300
13	Dunloop	750
14	Macdonald	225
15	Cranberry	900
16	Beckley	600
17	Rock Lick	225
18	Weirwood	750
19	Raleigh	1500
20	Minden	900
21	Wacomah	150
22	Detroit	150
23	Tomsburg	150
24	Gross Mine	150
25	Oakley	150
26	Quarrier	225
27	Empire	450
28	Kayford	750
29	Decota	1500
30	Elk Ridge	200
31-A	Sharon	150
31-B	Oakley	100
32	Winifrede Junction	300
33	Belmont	300
34	Winifrede South Mine	450
35	Winding Gulf Collieries	300
36	Pemberton	150
37	Milburn	450
38	Cannelton	300
39	Cabin Creek	150
40	Marting	300
41	Ronda	300
42	Page	300
43	Mount Hope	300
44	Skelton	150
45	Beckley City	300
46	Handley	300
47	Hugheston	225

TABLE III—DATA ON TRANSMISSION SYSTEM OF VIRGINIA POWER COMPANY, SERVED BY STEAM STATION AT CABIN CREEK JUNCTION

TRANSMISSION SYSTEM

Topography of Route	Conditions Subjected to	Maximum Elevation Above Sea Level in Ft.	Circuit Mileage at Each Voltage
Mountains	Snow, high winds and lightning	2500	44,000 volts 156 miles 2300 volts 29 miles

SUBSTATIONS

Number Substations	Rating in Kva. Each	Total Rating, Kva.	Location
50	150 to 1800	21,500	At and near mouth of mine

POLES AND TOWERS

Normal Height in Ft.		Spacing in Ft.		Type	No. of Circuits per Tower	Arrangement of Conductors	Vertical Spacing in Ft.	Position of Ground Wires
Total	Conductor Ground Clearance	Normal	Maximum					
62	30	500	800	Windmill and flexible steel towers for 44,000 volts. Wood poles for 2300 volts	Two on main line, one on branch lines	In two vertical planes normally, but in one horizontal plane across rivers	6.5	Two 0.375-in. steel wires on a cross-arm of all main line and one on apex of branch line towers grounded at every tower

CONDUCTORS

Material and Cross-Section	No. of Strands
No. 000 copper on main line and No. 0 and No. 2 copper on branch lines	Seven Solid

INSULATORS

Towers	No. of Disks	Type
Straight-line	3	No. 1129. R. Thomas Sons suspension
Angle	4	No. 1129. R. Thomas Sons suspension
Anchor	4	No. 1129. R. Thomas Sons suspension

of the obstacles in the path of the transmission line, it was found necessary in certain cases to increase the height of standard towers, and this was done by the use of 15-ft. extensions to the base of the standard designs of line towers.

Transformer Substations

The substations required to serve the coal-mining customers from the 44,000-volt lines have been installed by the mining companies themselves. Inasmuch as the average coal-mining company is a comparatively large user of energy, requiring a transformer equipment rating of from 50 kva. to 600 kva., it was deemed advisable to use outdoor types of transformer substations. The equipment at the substations and the arrangement of the substations themselves have been standardized. A standard design is illustrated on this page, and consists of rectangular frames of galvanized structural steel with the transformers carried beneath the switch gear delta-connected.

These substation structures have been designed so that the lines of spans of considerable length may be dead-ended to the steel frame without requiring the installation of a tower for this purpose. In some cases the meters with the instrument transformers are housed on this structure, while in others a separate metering and switching structure is provided. The lines from the low-voltage side of the transformers are carried directly to the individual substations serving the mines or led to rotary converters when direct current is required.

The transformers, oil switches, circuit-breakers, lightning arresters and other electrical equipment used in the substations were furnished by the Westinghouse Electric & Manufacturing Company. The transmission-line towers were furnished by the American Bridge

FIG. 13—AN INSTALLATION OF A STANDARD CUSTOMER'S SUBSTATION STRUCTURE

Company and the Archbold-Brady Company, and the insulators by the R. Thomas & Sons Company.

Mr. C. O. Lenz, consulting engineer, 71 Broadway, New York City, and chief engineer of the Virginia Power Company, designed and had charge of the installation of the transmission lines and substations.

"Teaching the Business" to the Employee

How the Boston Edison Company Instructs Its Men in Technical Subjects and in the Broader Matters of Relations with the Public

FEW industrial or public utility corporations have shown greater interest in employees' welfare during the last few years than has the Edison Electric Illuminating Company of Boston, Mass. The "plant" devoted to this use at the new general service buildings of the company may fairly be said to be unrivaled in the central-station field. As the nucleus of welfare activities in a system employing about 2000 persons, such facilities contribute much to the efficiency with which this branch of the company's affairs is administered. Among these activities the educational work of the company deserves emphasis at this time, for never in the company's history have the opportunities for gaining instruction been so extensive as during the season just closed.

An Educational Committee of Three

The work of instruction is under the supervision of an educational committee of three members, of which Mr. H. W. Moses, head of the welfare bureau, is chairman and Mr. R. S. Hale is secretary. The third member is selected from time to time, according to the nature of the courses under discussion. He is usually a department head whose advice is valuable when formulating plans for instruction in specific subjects. The committee is directly responsible to President Charles L. Edgar, whose interest in helping individual employees to become more efficient, both for their own and the company's benefit, has led to the carrying out of the present comprehensive program.

While there have been educational courses maintained by the company for a number of years in various branches of its work, the scale on which the past season's lectures and studies have been conducted is broader than has hitherto been feasible. The equipment and available meeting places have been made more convenient and freedom from interruption has been insured, with the result that the interest on the part of employees has been correspondingly heightened.

The Fall Course in Central-Station Subjects

As far back as August, 1914, the announcement was made in *Edison Life*, the company's monthly magazine, of a course of study and lectures "on the company." The course began on Sept. 11 and continued through six weeks. Two lectures were given weekly, the maximum time allowed for each being three hours on Tuesday and Friday mornings. The subjects and speakers were as follows: "Outline of Course and History of the Company," Mr. R. S. Hale; "Organization of the Company," Mr. L. D. Gibbs; "Selling for House Use," Mr. L. R. Wallis; "Wiring and Meters," Mr. J. W. Cowles; "Taking Applications for Service," Mr. E. C. Kimball; "Selling for Store Use," Mr. L. R. Wallis; "Billing and Collecting," Mr. H. P. Driver; "Maintenance of Lines," Mr. J. A. Vahey; "Lamps," Mr. J. W. Cowles; "Selling for Power," Mr. L. R. Wallis; "Appliances," Mr. W. Graydon Stetson, and "Welfare," Mr. H. W. Moses. Representatives from various departments were assigned to attend the sessions. Each session was followed by a written test lasting about twenty minutes, the answers being discussed at the following session prior to the rendering of the lecture. The foregoing lectures, which were given by heads of departments, were so well received that they were twice repeated. This course was in charge of Mr. R. S. Hale, assisted by Mr. P. E. Gleason, who was formerly associated with the Boston Continuation Schools.

In view of the success of this course, about a dozen others were planned for the winter and spring, and these were attended by about 200 employees. These courses included the following general subjects: "Salesmanship," "First Aid and Hygiene," "Auditing," "Business Arithmetic," "The Essentials in the Care and Handling of the Company's Apparatus and Material," "Standard Electric Wiring," "Advanced Stenography and Office Routine," etc.

Salesmanship and Public Relations

The course in "Salesmanship" had no formal program, but was developed along the lines of inculcating more efficient selling ability among solicitors and other employees in direct contact with the public. In the work thus far accomplished special emphasis has been placed on the avoidance of technical language in discussing electrical appliances with prospective customers.

Attention has also been given to a consideration of objections met in introducing equipment into the home and office, and to the demonstration of sales. Students in the course have at times acted as purchasers, while persons outside the company have also been asked to take the part of the unwilling "prospect." About twenty lectures and discussions completed the course, in which twenty-five employees were registered.

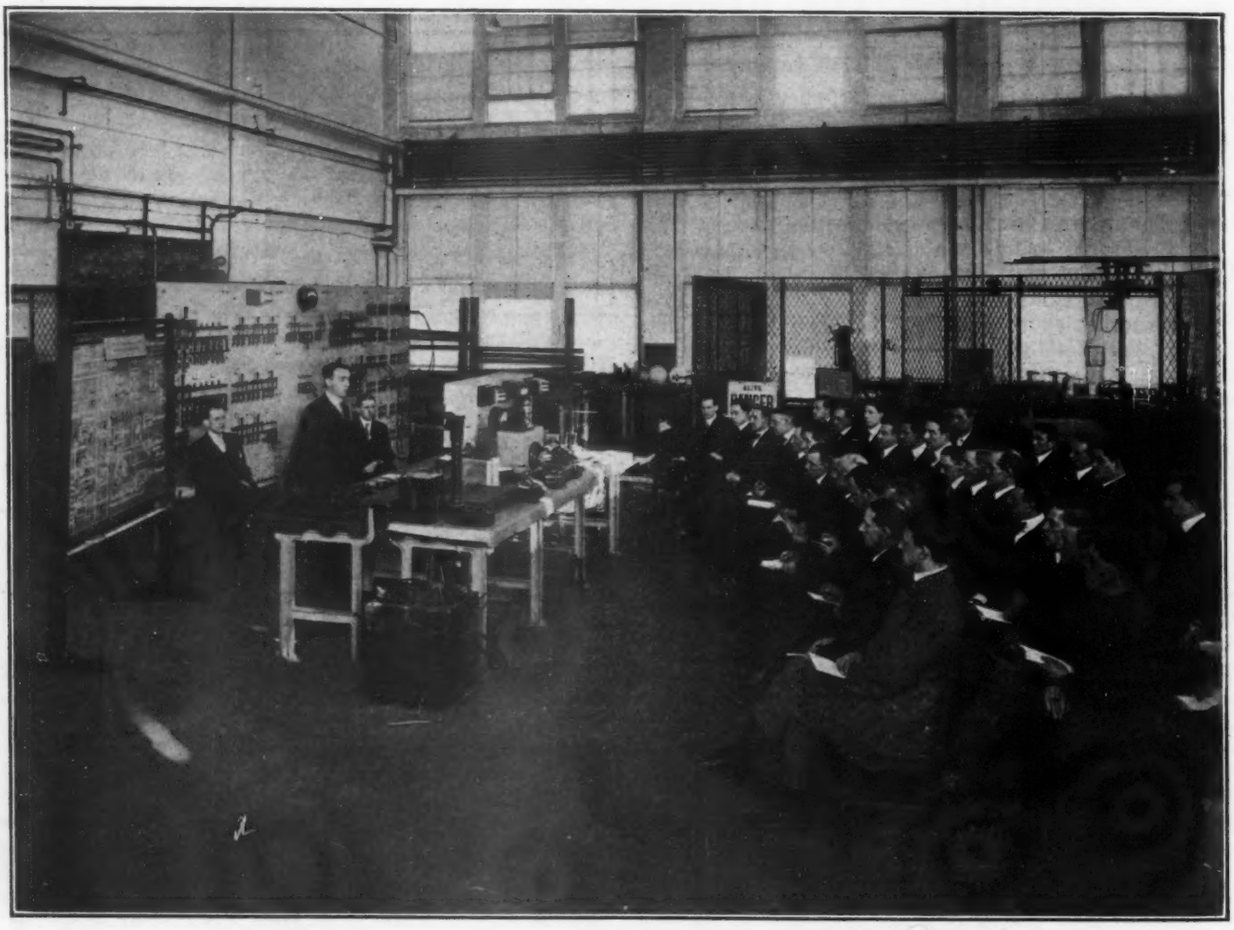
The educational committee preferred to limit the attendance in all of the regular study courses to about thirty or thirty-five so that the students might obtain the benefits of thorough discussion and examination. The object generally is to take the student out of purely routine ideas and to give him a larger grasp of the relation of his work to the company and to the public.

Care and Handling of Apparatus and Materials

One of the most interesting courses was that on "Essentials in the Care and Handling of Apparatus and Material." The course was designed to give employees in the supply department, primarily, some understanding of the uses of apparatus constantly on hand in the stockroom, of the fundamental principles of its operation and their relation to the elementary laws of electricity and physics, and of the importance of care in manipulating and transporting apparatus and materials. Thirty-five men were enrolled in this course, which consisted of twelve lectures and twelve examinations, lectures and examinations alternating weekly. Twenty-

QUESTIONS ON LECTURE NO. 2.

1. What is the National Electrical Code?
2. Who makes this code?
3. Who inspects wiring?
4. Why is wiring inspected?
5. What are switches for?
6. What are some requirements of a good switch?
7. What dimensions of a switch depend on voltage?
8. Why?
9. What dimensions of a switch depend on current?
10. Why?
11. Two switches are rated the same. Which should have a greater distance between the blades, the alternating-current or the direct-current?
12. Why?
13. What is a fuse for?
14. What governs the size of the fusible part?
15. Name three kinds of fuses.
16. Describe fully one kind of an inclosed fuse.
17. Name two kinds of fuse terminals.
18. What are time-limit relays used for?



A LECTURE IN THE LABORATORY, WITH APPARATUS MOUNTED FOR DEMONSTRATION—EMPLOYEES' COURSE OF THE BOSTON EDISON COMPANY

five of the students were from the supply department, the others being from the purchasing, street-engineering, station-engineering, accounting, and generating departments. The place of meeting depended upon the subject of the day, among the locations chosen being the company's laboratory, the committee room of the welfare bureau, the stockroom, the maintenance department, and some of the substations. Each student was notified by telephone as to the meeting place the day before the lecture or examination.

PROSPECTUS OF REPRESENTATIVE COURSE.

Essentials of the Care of Apparatus and Material in the Storehouse.

1. Materials of Electrical Construction.
   Metals in common use.
   Screws, bolts, drills, taps, pipe, etc.
   Gages, calipers, micrometers.
   J. A. Herlihy, chief inspector supply department.
   Conductors: Wires and cables, wire tables.
   H. W. Stevens, assistant superintendent street engineering department.
2. Current.
   Fuses and knife-blade switches.
   National Electrical Code.
   H. M. Morley, standardizing and testing department.
   Circuit-breakers, solenoids.
   Heating effects.
   Appliances.
   R. E. Dillon, technical assistant generating department.
3. Voltage.
   Insulating materials.
   Rubber, porcelain, paper, wood, oil, etc.
   Feeder regulators.
   H. W. Stevens, assistant superintendent street engineering department.
   High-voltage testing.
   C. L. Kasson, in charge of electrical testing laboratory.
4. Resistance.
   Rheostats, motor starters.
   V. J. York, in charge of steam testing, standardizing laboratory.
   Weights and measures.
   Instruments: Ammeters, voltmeters.
   S. R. Keyes, in charge of standardizing laboratory.
5. Inductance.
   Transformers, potential, line, station, and constant-current.
   J. A. Vahey, general inspector maintenance department.
6. Electrical properties, capacity, phase, frequency.
   Lamps, incandescent and arc.
   J. C. Norcross, assistant superintendent installations.
   Watt-hour meters.
   C. H. Ingalls, head of meter-testing division.
7. Tube system.
   Junction boxes, fittings, etc.
   T. H. Haines, assistant superintendent maintenance department.
   Line material, poles, arms, hardware.
   W. F. Stevens, superintendent supply department.
8. Oil switches.
   Overhead and underground.
   Station control.
   W. F. Willman, engineer station engineering department.
   Disconnecting switches, lightning arresters.
   T. E. Penard, engineer electrical division, station engineering department.
9. Rotary converters, frequency changers, turbines.
   G. E. Seabury, erecting engineer, station engineering department.
   Motors, generators and motor-generators.
   R. E. Dillon, technical assistant generating department.
10. Storage batteries.
    Vehicle and station; dry batteries.
    J. C. Walton, engineer station engineering department.
    Rectifiers.
    Vehicle and arc lamp.
    W. F. Willman, engineer station engineering department.
11. Miscellaneous materials.
    Paint, oil, varnish, alcohol, gasoline.
    J. A. Herlihy, chief inspector supply department.
    Ammonia, pitch, tape, etc.
    C. L. Hartshorn, chemist.
12. Trip to a substation.

Each lecture in this course consisted of two parts, with two speakers, each taking half of the period. The instructors were as a rule technically trained men occupying positions under a department head and thus being in closer contact with the students than their executive superiors. Notes were taken by the students at all lectures, and at the end of the course these were marked by the chief inspector of the supply department. The course was formulated by Mr. W. F. Stevens, superintendent of the supply department, with the assistance of Mr. T. E. Penard of the construction bureau and several department heads.

Syllabi of the lectures scheduled for each month were printed in the current *Edison Life*. The accompanying halftone illustrates a lecture on rheostats, motor starters, dimmers, weights and measures, and instruments, mounted for examination in the laboratory. The lecture covered the principles of operation and use of a variety of equipment, and included a discussion on adjustments, accuracy, sworn scales, principles of instrument operation, measurements of large quantities, recognition of various instruments, the use of certain instruments, the effects of stray fields, and precautions in handling.

Examinations and Credits

The examinations usually consist of eighteen questions—writing and neatness being counted as two extras. At some of the lectures the students were given copies of manufacturers' catalogs, wire tables, the National Electrical Code, etc., appropriate to the subject of the day. In the supply department fifteen men were assigned to take the whole course, ten others being excused from work to take every other lecture or so. Employees from other departments took the course voluntarily. In all these courses the company meets the entire expense, except in one or two instances where a nominal charge is made for textbooks. Full pay is given to all men taking a course during working hours. A typical examination in the course on the care of apparatus and materials is shown herewith.

The questions are intentionally made elementary, since the object of the course is to make clear the fundamentals so that stock-department employees will have a working knowledge of the equipment which they are constantly handling.

Courses in Business and General Subjects

The first-aid course called for about ten lectures, and that on auditing for about twenty lectures, with forty men enrolled. Fifteen were enrolled in the course on business arithmetic, the course consisting of working out examples under personal supervision. Fourteen students studied the wiring manual by themselves in a group and were afterward given an examination on the book when the work was completed. Much interest was shown, also, in the debating club. Twelve students were enrolled in the advanced stenography and office routine course, which included instruction in short cuts, as well as in work with notebook and typewriter. In the English course about fifteen employees, mainly from the stenographic division, made a systematic study of standard literature, with the object of developing vocabulary and expression. Prize examinations were also given on the Red Cross textbook on first aid and hygiene, the "Employees' Handbook," and the Edison rate schedules, the latter being intended primarily for members of the billing and sales departments.

Mention should be made in closing of the use by the company of the Russell Sage Foundation test of handwriting legibility, employees being graded accorded to the standard of this organization and receiving the utmost encouragement to improve their use of pen and pencil.

Mobile Color and Stage Lighting—II

Further Description of Apparatus—Parabolic Strip Units and Color-Mixing Strips—The Lamp Problem in Modern Stage Illumination

BY BASSETT JONES

THAT light as a mobile element offers an artistic medium for the realization of new notes of beauty in the production of stage effects was pointed out by the author in the preceding installment of this article, which appeared in these pages last week. Special unit equipment for stage illumination, including "spot" and "flood" lamps, basket units, elliptic borders, etc., was discussed at that time. In the present installment there are described the parabolic strip, the lens spot lamp, the color-mixing strip and other units.

The Parabolic Strip Unit.—In order to be easily transportable and flexible, this strip-lighting unit is made in sections 4.5 ft. long, each equipped for six 100-watt concentrated filament-lamps in bulbs with skirted base. Fig. 8 shows its general character. The reflector is a semi-parabolic cylinder, the centers of the lamp filaments being on the focal line. Each lamp is equipped with a hemispherical reflector so that practically all the light emitted by the lamps is received on reflecting surfaces of high efficiency.

Most of the light is projected in a sheet so that when set quite close to the top or bottom of a drop the whole drop is evenly illuminated. Adding units merely increases the average illumination of the entire drop surface. When on the road it is often convenient to set these strips on the stage floor where they can be masked as shown in Fig. 13-1. Otherwise they may be hooked on battens and hoisted in the usual way, as shown in Figs. 9 and 13-2. Halter hooks are provided for this purpose. Even when standing on the floor, it is easy to set the strips so that the sheet of light is directed toward the top of the drop, making the top brighter than the bottom. Any intermediate adjustment can be easily made, and when once determined for any production the adjustment may be locked in position. Semi-hyperbolic, cylindrical and aluminized diffusing reflectors may be employed with this unit. Specially shaped reflectors are used for diffusing the light in different ways. The different types of reflectors for each unit are interchangeable. These strips are also made for use as fly strips, when they stand on one end and hook to the fly battens in the usual way.

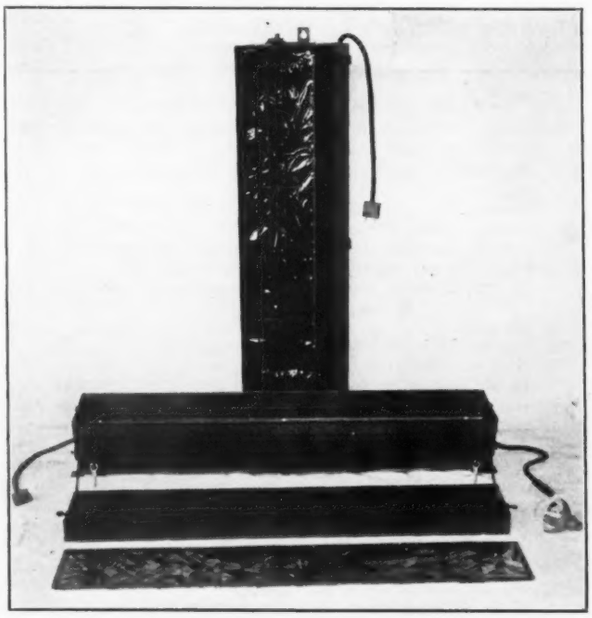
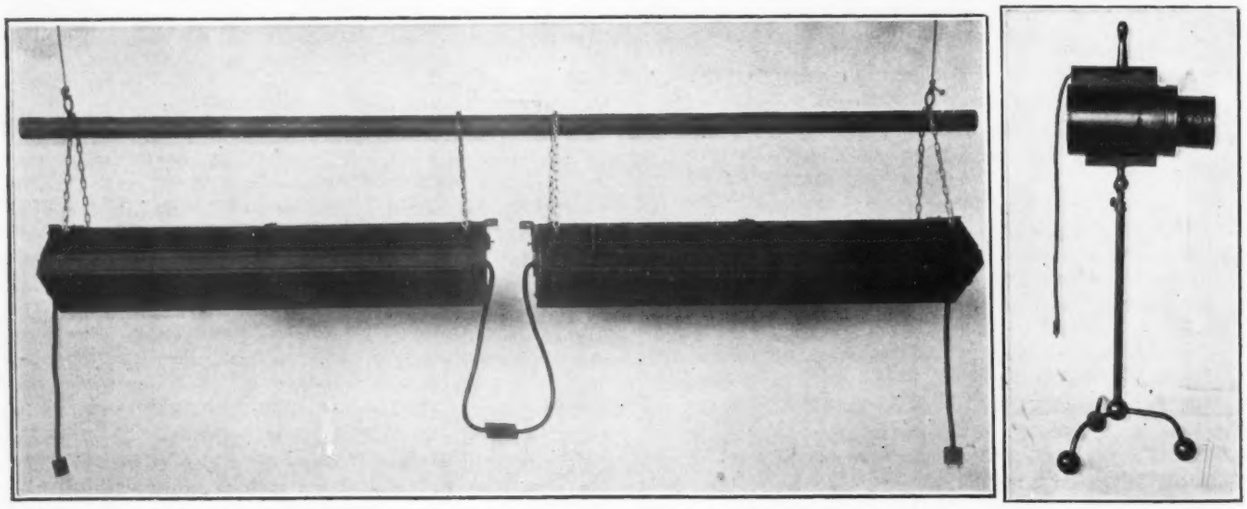


FIG. 8—PARABOLIC STRIP UNITS, ONE WITH COLOR SHEET AND HOLDER REMOVED TO SHOW CONSTRUCTION

When it is desired to cut out the direct light from the lamp and confine the light to a sheet, as, for instance, when a band of light of some definite color is wanted, use is made of sheet metal louvers of the form shown in Fig. 8, producing the result illustrated in Fig. 13-3. A single unit in a group may be employed for this purpose while the remaining units produce general illumination of the drop. Each unit is provided with stage cable at each end, so that when one end is equipped with a male and the other with a female two-pin connector a series of units may be hooked together on one circuit.

The strips are provided with long rectangular sheet-metal color holders with cross wires to keep the color filters flat and clips to hold the gelatines together at



FIGS. 9 AND 10—PARABOLIC STRIP UNITS SUSPENDED FROM BATTEN, AND LENS SPOT LAMP OF PEDESTAL TYPE

joints. Like the holders for the parabolic spot lamp, these holders are in two parts, the gelatines being placed between and the whole bound together with paper fasteners.

When color changes are required use is made of two series of these strips, alternate strips being connected on different circuits and equipped with different color filters. The wide spread of the light sheet prevents any discontinuity when one series is dimmed.

The Lens Spot Lamp.—For certain effects a spot lamp is needed where the range of spot diameter is greater than can be obtained with the parabolic spot lamp and louvers. For such purposes the spot lamp shown in Fig. 10 was designed. This unit can be employed with either the 100-watt or the 500-watt lamp and is generally similar to the arc spot lamp, except as to the light source. It can be dimmed or switched on or off at will, a self-contained switch being provided for this purpose. The adjustment of the lamp with relation to the lens is accomplished in a manner similar to the usual arc spot lamp. A spherical zonal reflector attached to the lamp socket is used to reinforce the direct light from the lamp so that not less than 25 per cent of the light is available. The socket and socket plate are easily changed for the two sizes of lamps. The unit, of course, operates at much lower temperature than the arc spot lamp and can be handled when hot. Its light is perfectly steady, and as it also requires no trimming, all of the obvious objections to the arc spot lamp have been eliminated.

One of the principal difficulties encountered in developing this unit was the action of the lamp bulb as a mirror to produce a zone of light surrounding the central spot. This was finally overcome by introducing between the lamp and the lens a perforated diaphragm to cut out the light from such reflections. These units have the usual color holders and slides. A hood is provided if desired to keep any light from falling on near-at-hand surfaces.

Such spot lamps are generally used with substantial stands, but may also be grouped on battens, if desired, and hoisted as a spot border. For this purpose halter hooks are supplied, so that the lamps may be hooked in any position to chains secured to the batten.

The Pistol Spot Lamp.—Where a small hand lens lamp is required to produce a small spot of light of face dimensions or even smaller, this device is used. This lamp is similar generally to the lens spot lamp described above, but uses a 6-volt automobile headlamp. Consequently it is provided with a sheet-metal lamp box in which are sockets to receive the lamps it is necessary to operate in series with the 6-volt lamp.

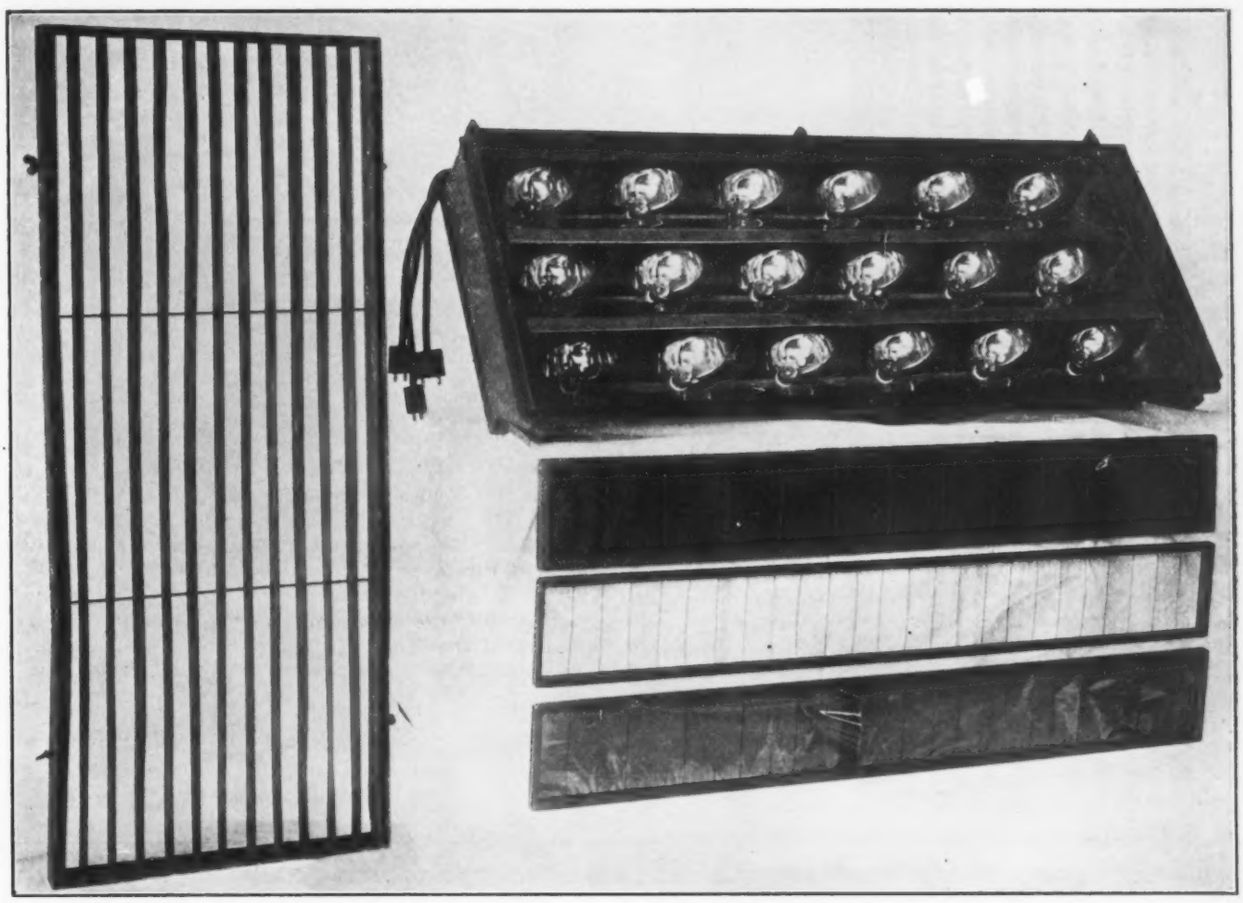


FIG. 11—COLOR-MIXING STRIP WITH COLOR SHEETS REMOVED TO SHOW LAMPS

The spot lamp is provided with a switch and can be sighted before the switch is closed, thus avoiding the usual trouble of "finding" the artist's face with the light spot and destroying the effect. These spot lamps with suitable color filters have been used to correct color distortion in the artist's make-up when the color of the general stage illumination made such distortion unavoidable. They have been called "complementary spots," as the color of the light emitted by them has at times been made complementary to the color of the general stage illumination, the resultant color being white or nearly so.

The Color-Mixing Strip.—This unit, which is shown in Figs. 11 and 12, has been called "'the canned sunset." It consists of three parabolic strip units assembled in a single casing, with separate color filters.

Usually one or two of these units acting in conjunction with a series of single parabolic strips are sufficient to produce a great variety of color changes on a back drop. The separate units in each strip are wired separately, and the three cables are brought out at each end similarly to the single parabolic strip units.

The first of these strips was designed several years ago with a view to introducing three-color mixing on the stage, resulting in a corresponding simplification in the method of producing color changes. This method consists in using light of three dominant hues only, red, green and blue, by various combinations of which any color, even approximate daylight or white light, may be produced as well as any gradation of tone and change of color through any desired series of hues. A stage once equipped in this way, using three circuits together with a circuit of white to produce variations in saturation or depth of color tone, can show any color or change in color desired.

The production of this original unit marked the first step toward the application of the three-color method to practical use on a large scale. Of course, with its development it was also necessary to produce a line of color filters especially adapted to this purpose, the light transmission of which would be as theoretically correct as would be financially practical.

It is not essential that the method be confined to this particular device. Three circuits of parabolic spot or basket lamps equipped with similar color filters will produce the same results so far as color is concerned. In fact, the method, as applied to the stage, is merely a special application of the general method of "synthetic illumination."

This three-color unit is furnished with louvers of various forms so arranged as partially to sort out the colors on the back drop in bands so that the frequent-banded effect of sunset or sunrise can be closely imitated. By proper dimming, these bands can be made to change slowly and melt into each other much as nature handles the illumination in the sky.

The "Footlight" Unit.—This unit is made up in two forms, one consisting of an aluminized reflector for each lamp with color filter and holder. The lamps are provided with hemispherical nickel-plated reflectors. The efficiency of the unit is so high that fewer lamps and less energy are required than with the form usually employed for this purpose. The lamps and color-filter holders are easily removed for cleaning or repair.

In the other form use is made of elliptic spot lamps set below the stage surface so as to get the lamp filaments out of sight with auxiliary reflectors above the stage.

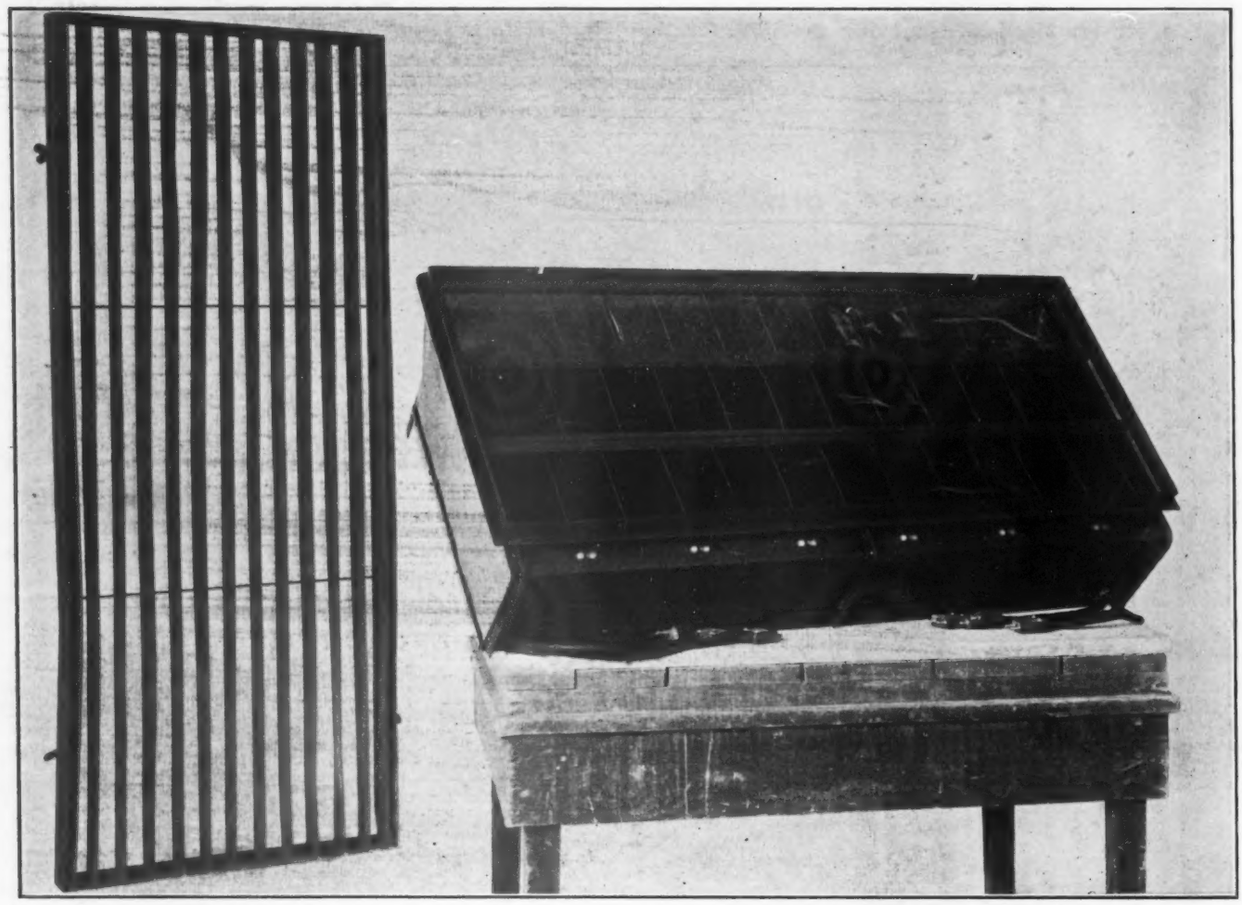


FIG. 12—COLOR-MIXING STRIP ASSEMBLED; AT LEFT, LOUVER USED TO SECURE COLOR-BAND EFFECTS

Lamps

It must not be assumed that the lamp problem is simple, or that any type of concentrated filament will answer the purpose. Incandescent lamps for stage use must be bought on specifications and built to meet the extraordinary conditions encountered in the usual theatrical practice. There is no inherent difficulty in obtaining the proper lamps, provided that the demands of the service are understood.

In the first place, the lamp must be extremely rugged in construction. The filament supports must be designed to withstand severe shocks. The filament itself must be of such form that it does not become excessively fragile at an early stage of its life. The bulb must be as small as practicable and yet not so small that it will become excessively hot, as good ventilation is not always

possible. The lamp must be designed to burn with reasonable satisfaction in any position. Long burning life cannot be expected as most lamps will, sooner or later, be destroyed through causes other than continued operation. The whole problem resolves itself into a series of compromises between what is desirable and what is commercially obtainable. The method is one of approximations. It is believed, however, that the devices described herein represent as close approximations to the mathematically exact as it is possible to manufacture for the commercial theatrical market.

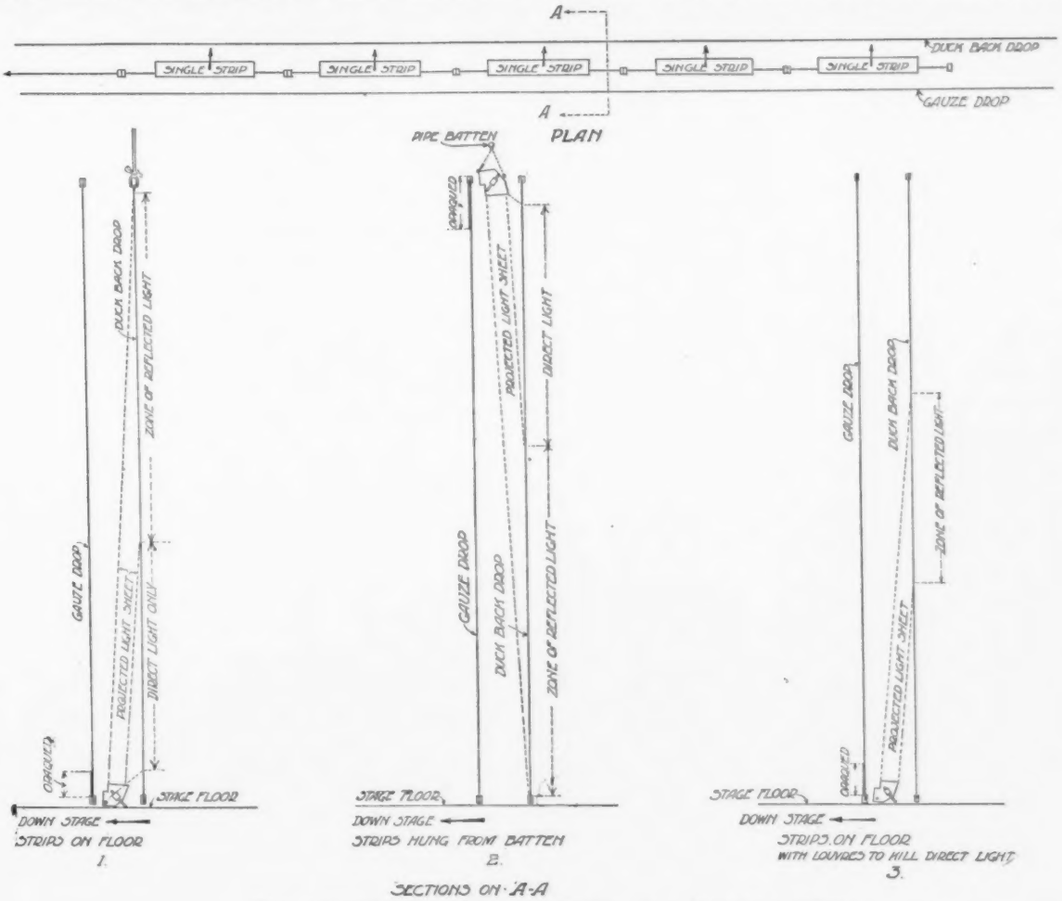


FIG. 13—TYPICAL ARRANGEMENTS OF PARABOLIC STRIPS

tion. It is practically impossible to secure even reasonably careful handling. Probably as the use of the large incandescent lamp on the stage increases this difficulty will cure itself. Refinement in efficiency must be a minor consideration. As long as the lamp will give good service for a reasonable time its manifest advantages are so great as to permit a generous sacrifice of all those other characteristics so dear to the heart of the manufacturer.

The requirements for ruggedness of construction and filament are best met by the concentrated-filament type of lamp, the closely wound, helical form of the filament and the short distance between supports giving it a spring-like resiliency. The filament support may be made largely of metal, and the portions that must be made of glass can be short and substantial.

The degree of concentration is a matter for careful consideration. The greater the concentration, of course, the nearer does the light-emitting body approach the desirable point source. On the other hand, the greater the concentration, the shorter the life of the lamp. As a matter of fact, a medium concentration has proved most practical and is permissible. Very close distribution of light is not often necessary or, indeed, often desirable. In any case, the slight inaccuracies of practical commercial reflector contours would prevent any exact distribution within close definite limits. It must be remembered that a variation of one degree in the slope of the reflector contour with respect to the direction of the incident light means a variation of two degrees in the direction of the reflected light. So that practically the solution of the whole problem resolves itself into a series of compromises between what is desirable and what is commercially obtainable. The method is one of approximations. It is believed, however, that the devices described herein represent as close approximations to the mathematically exact as it is possible to manufacture for the commercial theatrical market.

In the following installment of this article specifications of lamps for stage-lighting work will be presented and synthetic stage illumination discussed.

Electric Furnaces for Heat-Treatment of Automobile Parts

Recent developments in electric-furnace work made by the manufacturers in bringing out a type of furnace somewhat resembling in principle the operation of the Nernst lamp give promise of better furnace durability. In this new furnace both the floor and the dome-like cover are of a refractory material which is practically non-conducting at ordinary temperatures. The furnace is started by passing a current through a path of coke laid on its floor which then heats up and becomes a conductor. In turn the floor heats the walls and top, rendering them conducting, so that when finally in operation the entire furnace becomes an incandescent resistor. As already intimated, this new type of furnace is believed to promise great results. Meanwhile the automobile manufacturers and other users of heat-treated steel seem willing to incur almost any expense to get the uniform, dependable heat they require. One manufacturer, for example, cheerfully paid $1,600 for an electric furnace, although an equivalent gas-heated one was offered him for $400.

DIGEST OF ELECTRICAL LITERATURE

Generators, Motors and Transformers

Heating of Oil Transformers.—JOSEF KLEIN.—An article on the heating curve of self-cooling oil transformers. The author gives a more exact formula than that usually employed. His formula may also be used for oil switches, etc. The author discusses the formula and compares it with the orthodox one with the aid of a numerical example.—*Elek. u. Masch.* (Vienna), May 2, 1915.

Retardation Methods of Testing.—G. REBORA.—The retardation method of testing revolving machinery for the determination of the different losses is well known. The author gives some very simple formulas and suggests the best arrangement in the application of this method to the tests of large revolving machines and rolling stock. Two numerical examples are added.—*Elettrotecnica*, Jan. 15, 1915.

Lamps and Lighting

Shaping Metallic Filaments.—A note on a recent British patent (No. 14,229, 1914) of the British Thomson-Houston Company and the General Electric Company of this country for a method of giving a zigzag shape to continuous filaments. It consists in winding a number of turns of the wire, each turn of figure 8 form, on a pair of conducting supports, and heating the wire by passing current through it from one support to the other. In the case of tungsten the temperature is about 2000 deg. C.—London *Elec. Eng'ing*, July 1, 1915.

Vaporization of Carbon.—O. LUMMER.—An English translation of a summary of his German book on the vaporization of carbon in the electric arc, under special conditions, and the production of the solar temperature, noticed before in the Digest.—London *Electrician*, July 9, 1915.

Color Photometry.—C. C. PATERSON AND B. P. DUDDING.—Their paper in full, an abstract of which has been noticed before in the Digest, on the estimation of high temperatures by the method of color identity.—*Phil. Mag.*, July, 1915.

Miner's Lamp.—An illustrated description of electric safety lamps for mines as made by a Belgium company. There are now 12,000 portable electric miners' lamps in use in Belgium.—*La Revue Elec.*, March 5 (published May 28), 1915.

Light Emission from the Crater of Carbon Arcs and Lambert's Law.—A. AMERIO.—In the present article the author examines Trotter's researches on Lambert's cosine law on the emission of light from the crater of arc carbons. He explains how the brightness of the light is determined in different directions, between 15 deg. and 72 deg., and shows that this brightness is constant in all directions. Finally the total radiation in the different directions is measured by means of a thermocouple, and the author shows that the cosine law is followed.—*Elettrotecnica*, Jan. 5, 1915.

Generation, Transmission and Distribution

Excess Water-Powers.—BRUNO THIERBACH.—Of the three projected water-power plants at Hemfurt, Helminghausen and Muenden, which are to utilize the water-power of the upper Weser River district, the first, with a rating of 10,000 kw., will be started shortly. It will be able to furnish 41,000,000 kw.-hr. during the year, but only one-half is available regularly throughout the year. The rest could be sold only to plants which would not require power continuously but could work with intermittent operation. Of course, the energy would be sold very cheaply. The author gives formulas as to the conditions under which an undertaking in which a certain capital is invested can use economically an intermittent process so that the temporary losses of interest on the invested capital are compensated for by reduction in the price of energy. The technical possibility of working intermittently is to be taken into consideration separately in each case.—*Elek. Kraft. u. Bahnen*, May 14, 1915.

Calculation of Long Transmission Lines.—RENZO NORSA.—Summing up the discussion on the calculation of long transmission lines which has been carried on by different authors in the preceding numbers, the author gives, on the basis of Kennelly's theory, the results for the two usual methods which suppose the capacity to be concentrated either in the middle or at the terminals of the lines respectively.—*Elettrotecnica*, Jan. 5, 1915.

Installations, Systems and Appliances

Shanghai.—T. H. U. ALDRIDGE.—Extracts from his annual report of the municipal plant of Shanghai. Last year's revenue was $848,125. Working and general expenses, including depreciation ($146,070), were $614,575, and after providing for capital and other charges the net profit was $55,450. The working expenses per kilowatt-hour sold were 1.368 cents. The motors connected were equivalent to 12,181 hp., or an increase of 6917 hp. over last year. The kilowatt-hours sold were 32,623,671, compared with 19,928,446 the previous year. The war has had no effect on the station besides delay in the delivery of some sections of the new plant. The total rating of the two stations is 14,900 kw., and except for the non-delivery of the 5000-kw. machine it would be 19,900 kw. A 20,000-kw. extension is planned for next year with distribution by underground cables at 20,000 or 30,000 volts. Electric heating is making progress in Shanghai. Chinese as well as European consumers hire electric radiators from the station. At the end of last year 871 electric radiators were connected, representing about 1700 kw., while fifty-two electric cookers were in use. Power is largely used for cotton mills, flour mills, etc.—London *Electrician*, June 18, 1915.

Electric Hotel Equipment.—An illustrated description of the electrical equipment of the new Regent Palace Hotel in London, which is said to be the largest hotel in Europe, accommodating some 1500 guests. There are in all some 300 miles of pipes in the building, 15 miles of air ducts, 180 miles of electric cable, and upward of 300,000 ft. of screwed conduit. There are 1028 bedrooms, each of which can be warmed by a 1.5-kw. radiator, but the heating of the building is mainly effected by hot-water and steam radiators, electric centrifugal pumps assisting in the water circulation. The temperature of the water is automatically controlled by electric valves. The heating and regulating systems are controlled by a single man in the controlling room, which contains a large number of electrical instruments. Current is supplied to the hotel at 220 volts from a supply company. The general scheme of illumination is on the semi-direct system. The lighting installation includes 6000 osram lamps.—London *Elec. Review*, June 25, 1915.

Transformer Connection.—V. E. METCALF.—An illustrated description of an "unusual" transformer connection which can be used in transforming from three-phase to two-phase, and which is really a modification of the so-called "three-transformer method."—*Univ. of Colo. Journal of Eng'ing*, No. 11, May, 1915.

Switchboards.—E. H. BECKERT.—An illustrated account of recent developments in switchboard design and construction, especially recent modifications and developments of relays, oil switches, circuit-breakers and instruments.—*Gen. Elec. Review,* July, 1915.

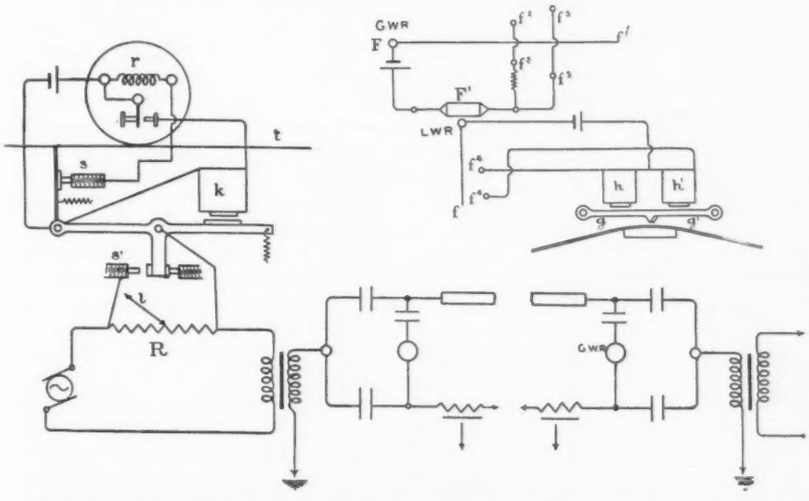
Electrophysics and Magnetism

Mobilities of Ions in Air.—E. M. WELLISCH.—An abstract of an American Physical Society paper. The mobilities of the positive and negative ions formed in thoroughly dried air by the alpha rays of polonium were determined over a wide range of pressures. In the case of the negative ion the results were normal from a pressure of 1 atmosphere down to about 8 cm. Below 8 cm. the negative carriers were found to consist of two kinds, electrons and ions, the former increasing in number relatively to the latter with diminishing pressure. No evidence was found of an intermediate or transition stage, the separation between the faster and the more slowly moving carriers remaining throughout well defined. The mobility of the negative ion was found to vary inversely as the pressure down to the lowest pressure employed (1/7 mm.). This indicates that the negative ion remains unaltered in nature over this wide range of pressures. The positive ion was found to remain unchanged from 1 atmosphere down to 0.05 mm., which was the lowest pressure tried.—*Phys. Review,* July, 1915.

Units, Measurements and Instruments

Ballistic Use of a Moving-Coil Galvanometer.—A. G. WORTHING.—A brief abstract of an American Physical Society paper on the ballistic use of a moving-coil galvanometer in measuring discharges obeying the exponential decay law. The author's method of obtaining a time constant has been used, with considerable advantage in accuracy, in a modification of a method of measuring thermal capacities at incandescent temperatures, given by Corbino.—*Phys. Review,* July, 1915.

Short Vacuum Gage.—E. KARRER.—An abstract of an American Physical Society paper. The gage is in general form and manner of working exactly like the Gaede gage. Its construction, however, is simpler and very much more durable, owing to the entire elimination of rubber tubing.—*Phys. Review,* July, 1915.



ONE FORM OF DUPLEX-CIRCUIT ARRANGEMENT FOR TRANSMITTING AND RECEIVING MESSAGES BY ALTERNATING CURRENT

Telegraphy, Telephony and Signals

Unbroken Alternating-Current for Cable Telegraphy.—G. O. SQUIER.—A long illustrated description of a paper read before the (British) Physical Society. The author describes a system of submarine cable telegraphy in which a low-frequency (four to ten cycles) sine current is allowed to flow continuously through the cable. The signals are made by varying the amplitude, the variation in the impedance being made at the moment when the current is zero, with the result that the pure sine character of the wave is maintained. The author regards the cable as a power line along which energy from a single-phase alternating-current generator of low frequency is conveyed to the receiving end, where the recorder is classed as a form of alternating-current motor. The question which he asks himself is: What minimum departure from this ideally simple arrangement is unavoidable if it is to be rendered capable of transmitting telegraphic signals? The solution adopted is to communicate a dot by an increase in the amplitude of a semi-cycle, and a dash by a still further increase. To attain this object a resistor is put in series with the sending-end transformer, part of which, by the action of the automatic transmitter, is short-circuited for a dot, and the whole of which is short-circuited for a dash. Micrometer adjustments insure that the changes at the sending end take place in correct phase. At the receiving end the usual pattern of Muirhead gold-wire relay is modified. Normally the alternating current on reception is just too weak to actuate the relay, and a space is the result, but the increased current of a dot makes contact, and the still greater current of a dash causes the gold wire to move out still further and close a second contact. A local circuit is completed through these contacts, and a specially light printer automatically records the message on the receiving tape. In order that as nearly as possible an uninterrupted alternating current may be obtained, the adjustments at both ends are made in such a way that the amplitude of the space current is as great as possible, and the amplitude of the dot and that of the dash differ from it by as little as possible. The cut shows diagrammatically one form of circuit arrangement based on the above principles for transmitting and receiving messages. The usual transmitting condensers are shown in the arms of the duplex bridge. The ordinary transmitting tape t is caused to move synchronously with the generator by being geared directly to its armature shaft. The general operation of the transmitter mechanism is as follows: When no holes are perforated in the tape t, the whole resistance R is in the primary circuit and an alternating current is transmitted, which corresponds to spaces between letters and words, and when a perforation in the tape is on the dot-side part of this resistance R is short-circuited, and when a dash perforation occurs all of this resistance is short-circuited. The relative values of these resistances being adjustable, the amplitude of the individual alternations is under complete control by the ordinary transmitting tape. In the figure is shown diagrammatically the arrangement for causing a dash impulse to be sent by the transmitter by short-circuiting the whole of the resistance R for a time corresponding to one semi-cycle of the alternator. r is an ordinary relay; k is an electromagnet which operates at the end of each signal or group of signals. The line l leads to an exactly similar arrangement which is provided for the dot impulse by which a

certain proportion of the resistance R is short-circuited. In practice these two arrangements are side by side, and in the figure the dot arrangement would be immediately behind the one shown for the dash. One practical arrangement for receiving the signals on a Morse printer is shown diagrammatically in the right-hand part of the figure. F is an adaptation of the Muirhead gold-wire cable relay, in which f' is the gold wire which oscillates between the platinum contact posts f^2, f^2 about a fixed point at F. A second pair of posts f^2, f^2 is provided, and each of these pairs has an adjustment for altering their distance apart and also for moving them longitudinally along the gold wire and relatively to each other. Instead of being separate contacts, as is the usual case with this relay, each of the pairs is electrically connected as shown. F' is a local wire relay similar in principle, and f is its moving part which in its oscillations makes contact with the posts f^1, f^1, adjustable as above; h and h' are electromagnets for operating the dot and dash arms of the printer; g and g' are two arms pivoted at their outer ends, adapted to make a siphon record at their free ends in the center upon the moving tape shown beneath. The arm g' is forked to record two ink marks on the tape symmetrically on either side of the central mark made by the arm g, and in line with it across the tape, so that both arms can make a record simultaneously on the tape for a dash. The incoming alternating current thus causes the gold wire f' to oscillate back and forth with different amplitudes, depending upon whether dots, dashes or spaces are being received, and the posts f^3, f^3 are adjusted so that the space amplitude just does not make contact, but does make contact for a dot amplitude of either sign. In like manner the posts f^3, f^3 are adjusted so as just not to record a dot impulse, but to make contact for the larger amplitude of a dash of either sign. It is seen that both a dot and a dash contact are made whenever a dash amplitude is received. The flexible gold wire f' in its motions about F first strikes the posts f^3, f^3, and a bending or wrapping effect is produced in the wire, which for the stronger dash impulses causes contacts with f^4, f^4 also. The relay F' operates similarly through a moving arm, making contact with the posts f^4, f^4 separately or both together, depending upon the amplitude of its swing. The printer itself becomes an apparatus of marked simplicity and is nothing more than two small siphons adapted to mark on the slip in the usual manner.—London *Electrician*, July 2, 1915.

Miscellaneous

Municipal Electrical Association.—An account of the annual general meeting of the British Incorporated Municipal Electrical Association. Mr. A. C. Cramb, the acting president, is to continue as president. The annual report of the board first deals at length with several legal matters and then gives the reports of the development committee, with the sub-committees on publicity, on electric installations and on domestic appliances, and the report of the electric vehicle committee. Concerning the affiliation with the Electric Vehicle Association of America, the latter report says: "The committee desires again to refer to the most useful results which have followed upon the continued affiliation with this important association through the membership of its honorary secretary. The association, both through its most energetic executive secretary, Mr. A. Jackson Marshall, and the chairmen of its various committees, has shown itself most anxious to help this committee whenever such help has been asked. The committee desires to place upon record its appreciation of the value of this co-operation and its thanks for much useful information."—London *Electrician*, June 25, 1915.

Book Reviews

ELEKTROCHEMIE WÄSSERIGER LÖSUNGEN. By Dr. Fritz Foerster. Leipzig, Germany: Johann Ambrosius Barth. 804 pages, 186 illus. Price, paper, 30 marks; cloth, 31.5 marks.

An excellent textbook on that branch of the great science of electrochemistry which deals with aqueous solutions. It is well adapted for use in technical college classrooms, and also as a reference book for the students of electrochemistry. The book is divided into fifteen chapters, dealing with the following subjects: Electric energy, Faraday's law, electrolytic dissociation, the movement of ions, electrolytic voltages, resistance in electrolytes, electric osmose, voltaic production of power, general theory of electrolysis, the electric production of hydrogen and oxygen, metallic electrolysis, applications of metallic electrolysis, electrolytic reduction, the electrochemistry of the halogens, and electrolytic oxidation. The treatment is clear, and mathematical dissertations are avoided. The viewpoint is essentially that of the electrochemist. The energy relations of the various reactions are prominently considered. The book will recommend itself to students of electrochemistry familiar with the German language.

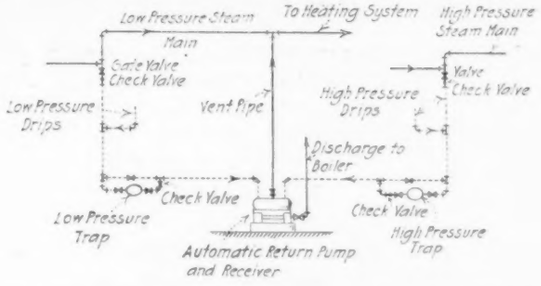
ALTERNATING-CURRENT ELECTRICITY AND ITS APPLICATIONS TO INDUSTRY. First Course. By W. H. Timbie and H. H. Higbie. New York: John Wiley & Sons, Inc. 534 pages, 389 illus. Price, $2.

This book is the result of an attempt to present a sound and thorough treatment of fundamental principles while keeping constantly before the reader the practical applications of these principles to electrical machines or industrial methods and processes. The belief that the student is likely to take more interest in his studies if the matter is so presented is probably well founded, but the carrying out of such a plan is by no means a simple matter, and there are some features of this book which will not commend themselves to all teachers of electrical engineering. In the first chapter are described very briefly the various systems of energy transmission, with a view to explaining the place occupied by alternating-current electricity in this connection. The case of continuous currents is very briefly disposed of by the statement that "American engineers have considered it undesirable to use direct currents at high voltages." In a treatise purporting to instruct the reader and, presumably, help him toward a broad outlook in engineering matters this statement seems, at least, inadequate. The fact that American engineers have seen fit to disregard the very obvious and manifold advantages of direct-current transmission under favorable conditions is not sufficient reason for leaving the rising generation in the old rut by, as it were, putting an obstacle in the way of their getting out of it. As a whole, the book has been carefully planned and is consistent throughout. Hydrodynamical and mechanical analogies are very freely used, and the practical applications of general principles are clearly explained. The illustrations are good and do not include too many halftone reproductions from makers' catalogs, thus avoiding a mistake which is not uncommon in books of this nature. One good feature of the book is the large selection of examples and problems which add to its value as a text for use in the classroom. It is explained in the preface that this book is to be followed by the "Second Course," which will explain in greater detail matters relating to construction and operating characteristics, but each course is complete in itself, and (presumably) the two courses cover much the same ground.

POWER AND OPERATING SECTION

A Scheme for the Disposal of High and Low Pressure Steam Drips

High-pressure lines are frequently drained by means of traps which return the condensation to a main receiver, from which it is discharged by a pump to boilers. A considerable quantity of the condensation will reevaporate upon liberation in an atmospheric pressure receiver, for the latter usually receives also the returns from low-pressure drips. In such cases a vent may be



AN ARRANGEMENT THAT PREVENTS STEAM IN DRIP RECEIVERS AND BACK PRESSURE ON TRAPS

connected from the receiver into the low-pressure steam main and the resulting steam used for heating purposes. This arrangement has the advantage of obviating the nuisance of steam in the receiver and at the same time eliminates any back pressure on other traps tending to prevent their proper operation.

Ventilating Requirements of Vertical Waterwheel Generators

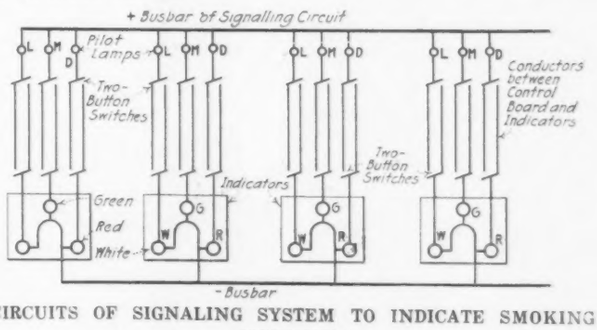
Since the vertical waterwheel type of generator usually takes its cooling air from below the station-floor line and discharges it into the generator room, provision must be made for an adequate supply of cooling air. It is a simple matter to provide suitable ducts for the air supply leading to the pit beneath the generators during the construction of foundations, but a rather difficult matter to change such arrangements or make additions to them after the completion of the plant. The object to be attained in the design of air ducts is to keep the friction head down to a small percentage of the available air pressure. The ducts should, therefore, be as straight and as few as possible, and the air velocity through them should be relatively low. A sudden bend in the ducts is more detrimental than high velocity in a long, straight duct, for if the available pressure is high, the size of the ducts may be reduced. The peripheral speed of the rotors of very slow-speed machines is so low that efficient ventilating vanes which will build up an appreciable air pressure cannot in some cases be provided. In such instances separate motor-driven fans such as are used with highly rated turbine-driven units afford a mechanical solution of this problem. The efficiency of these fans is high, and they are able to supply the air at relatively high pressure, thus cutting down the size of the air ducts required. When they are provided with variable-speed motors they can be operated so as to furnish a pressure to suit the load, or they may be shut down altogether.

With certain small and very slow-speed machines, the permissible air velocity through the ventilating ducts may be taken at from 300 ft. to 400 ft. per minute. For machines of higher peripheral rotor speed the air velocity may be 1000 ft. to 1500 ft. per minute or higher. It has been found that when the air in its passage through a generator rises in temperature more than 15 deg. to 20 deg. C., the cooling air does not effectively conduct the heat generated in the machine, and additional air could be supplied to good advantage.

For ventilating generators experience seems to show that it is desirable to provide from 125 cu. ft. to 150 cu. ft. of air per minute per kilowatt loss in the generator. For a 1000-kw. machine with 93 per cent efficiency the loss is about 75 kw. To properly conduct away the heat generated by these losses, from 9000 cu. ft. to 12,000 cu. ft. of air per minute should be provided. In considering this matter of ventilation it is to be remembered that the energy represented by windage losses must also be taken care of by the cooling air. The bearing friction is the only component of the total losses that does not need to be considered.

A Method to Notify Firemen When Chimneys Smoke

At one of the large steam stations in the East a lookout is posted in an observation tower on the roof to signal the firemen when smoke issues from the chimneys. The signals not only indicate which stack the smoke is rising from but also show whether it is thin, medium or dense. Thus advised, the firemen are able to tell which group of furnaces is operating improperly, and roughly how much the air supply must be adjusted to prevent smoke.



CIRCUITS OF SIGNALING SYSTEM TO INDICATE SMOKING CHIMNEYS

The signal system comprises a push-button control board, an indicator and a signal-acknowledging board. The control and signal-acknowledging board each contain as many sets of gang switches as there are chimneys. Each gang switch consists of three two-button switches labeled light, medium and dense, those in the observation tower being connected in series with corresponding ones in the fireroom through pilot lamps on the control board and indicator lamps at one end of the firing aisle.

When the lookout pushes a button it lights the cor-

responding pilot lamp and an indicator in the firing room and at the same time rings a bell. The fireman acknowledges the signal by pressing the corresponding switch, which extinguishes the indicating and pilot lamps. To keep a check on the fireman and make sure that reports of smoke are attended to, the lookout is required to fill in a log sheet showing the time a signal is given and when the smoke conditions are corrected. In order that the lookout may not have to depend on his judgment as to when smoke is light, medium or dense, three cross-ruled sheets of paper having different percentages of black area are posted outside the observation tower where their color can be compared with that of the smoke.

The indicators in the fireroom consist of box-shaped cases with translucent-glass faces bearing letters that indicate the stack with which they correspond. Inside each case are three lamps, one with a clear glass bulb, another with a green bulb, and a third tinted red. The white lamp indicates light smoke, the green smoke of medium density, and the red very thick smoke. The lookout is also employed to inform the load dispatcher when a storm is seen approaching, and during spare moments he does clerical work.

Convenient Control for Machine-Tool Motor Drives

Convenient methods for reversing and controlling three-phase induction motors directly connected to machine tools are shown in the accompanying illustrations. The machine tool in Fig. 1 is a horizontal boring mill with a switch for reversing mounted on the base and operated by a vertical handle in such a position as to bring the control at a convenient place for the operator. The switch used is a General Electric two-pole, double-throw design. The switch blades are of copper with carbon contact points, which engage similar carbon contacts mounted on the base of the switch.

A convenient mounting for the control switch of a motor on an engine lathe is shown in Fig. 2. The switch

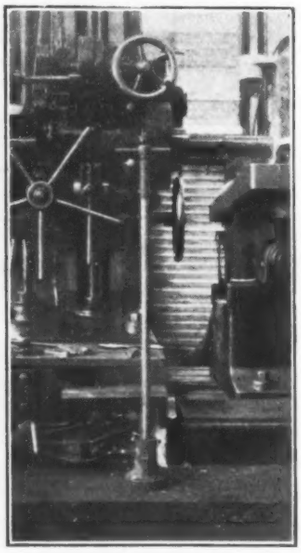


FIG. 1—REVERSING SWITCH OPERATED BY A VERTICAL HANDLE

used is a Trumble single-throw, three-pole design immersed in oil and operated by an auxiliary shaft carried along the body of the lathe. A key-way is cut the entire length of the shaft and where it passes through the carriage of the lathe is engaged by a spline which is actuated by the lever shown at the extreme right of the illustration. For any position of the lathe carriage the control of the motor is at the hand of the operator, a convenience which not only makes the motor drive most efficient for machine-tool operation but also adds to the safety of operation.

These methods of control are installed in the shops

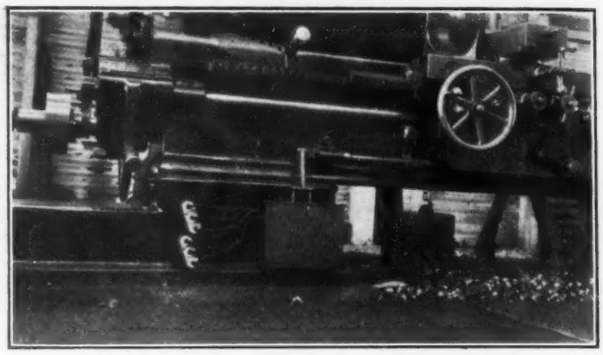


FIG. 2—CONTROL OF LATHE MOTOR AT OPERATOR'S HAND FOR ANY POSITION OF CARRIAGE

of the Pelton Water Wheel Company, San Francisco, Cal., according to designs by Mr. J. Kraus, shop superintendent.

Operating Expenses of Massachusetts Steam Stations

The data given in the accompanying table represent an analysis of the officially reported operating expenses of steam-electric stations in the State of Massachusetts that generated or purchased more than 5,000,000 kw.-hr. of electrical energy during 1914. The figures are based upon the returns of companies made to the Board of Gas and Electric Light Commissioners. On account of the fact that a number of the companies purchase and distribute energy in addition to the output of their stations, the operating expenses are divided into those due to station operation and those due to distribution. All expenses are given in cents per kilowatt-hour so that the relationship of the various items in any one plant can be easily found. When comparing the same items of different stations, such as wages, office management, taxes and the like, it must be remembered that the relative magnitude of the station outputs must be considered in order to make a fair comparison.

Of the twenty stations for which data are given, twelve are in cities of from 40,000 to 100,000 people and have a station output varying for the most part between 5,000,000 kw.-hr. and 15,000,000 kw.-hr. per annum. It is interesting to note that the total output for the stations reported excluding Boston in eighteen cities of a total population of 1,194,870 is 209,250,000 kw.-hr., which is only 20,530,000 kw.-hr., or 10 per cent, more than the reported annual output of the Boston company in a city of 670,585 people. The averages given in next to the last column for the operating costs of the preceding nineteen stations are interesting when compared with the costs for the Boston company. The figures in the average column represent in a general way the average of conditions as regards operating costs for stations similar in size and yearly output when varying conditions as regards plant-factor and load-factor are ignored. The cost data for the Boston company, on the other hand, represent results of a highly specialized system operating under conditions which favor reduced costs per kilowatt-hour. This is particularly noticeable in the cost of fuel, wages and station repairs, these values being lower than the average of the values for

the other stations of the State. The cost of repairs to electrical equipment, tools and appliances and repairs to lines is, however, higher for Boston than the average of the values for other stations of the State, as might be expected. In addition, the cost of management and taxes for the Boston station is more than twice the average value for the State, yet the net operating return per kilowatt-hour for Boston is one and one-half times that for the State. In the case of the Boston company taxes per kilowatt-hour are considerably more than the cost of coal per kilowatt-hour, while for the entire State the item of taxes is about equal to the cost of coal.

The averages for the stations of the State show the cost of fuel to be about 70 per cent of the total station operating expense, wages to be 26 per cent, with the remaining percentage accounted for by oil, waste, water, tools and repairs.

Reasons for Fusible-Tin Boiler Plugs Failing to Melt

The failure and deterioration of fusible-tin boiler plugs in service has been investigated by Messrs. G. K. Burgess and P. D. Merica, physicists of the Bureau of Standards, Washington, D. C. In some cases it has been found that such plugs have failed to melt and thus give warning of dangerous boiler conditions. The investigation has shown that in these cases the tin filling had become oxidized to tin oxide, which has a melting point above 2900 deg. Fahr.

About 1050 plugs, 100 of which had been in service, were subjected to examination. This included inspection of design and construction, condition and purity of the tin filling, and in the case of the used plugs their classification according to the type of deterioration undergone in service.

One pronounced and dangerous type of deterioration is the oxidation of the tin along the grain boundaries

OPERATING EXPENSES FOR 1914 OF MASSACHUSETTS STEAM STATIONS OF AN ANNUAL OUTPUT OF MORE THAN 5,000,000 KW.-HR.

	Cambridge	Easthampton	Brockton Edison	Fall River	Fitchburg	Greenfield	Haverhill	Holyoke	Lawrence	Lowell	Lynn
Type of prime mover	Turbines	Turbines and engines	Engines	Turbines	Turbines and engines	Turbines	Turbines and engines	Turbines	Engines	Engines	Turbines and engines
Station equipment rating in kw	7400	4050	10,926	10,000	4800	5491	4950	6700	10,942	5400	6650
Output in million kw.-hr	12.40	2.40	13.99	13.57	7.11	7.70	6.93	13.94	6.82	12.78	12.00
Cost of coal, dollars per ton	3.93	4.28	4.65	3.93	4.33	4.45	4.78	4.79	4.80	4.58	3.73
Coal per kw.-hr. in lb	2.54	3.15	3.05	2.51	4.07	*	3.07	*	*	3.07	2.86
Population in thousands	104.84	8.52	56.87	119.29	37.82	10.42	44.11	57.73	85.89	106.29	89.33
Operating expenses due to station operation in cents per kw.-hr. made:											
Coal	0.447	0.602	0.635	0.441	0.795	*	0.655	*	*	0.629	0.476
Oil and waste	0.013	0.006	0.006	0.006	0.013	*	0.013	*	*	0.009	0.013
Water	0.028	0.002	0.001	0.013	0.030	*	.....	*	*	0.004	0.030
Wages	0.345	0.327	0.235	0.135	0.237	0.170	0.202	0.204	0.348	0.195	0.198
Station repairs	0.030	0.001	0.026	0.018	0.017	0.010	0.012	0.004	0.056	0.016	0.054
Steam equipment repairs	0.033	0.111	0.056	0.014	0.018	0.018	0.058	0.044	0.018	0.066	0.142
Electric equipment repairs	0.030	0.020	0.011	0.045	0.001	0.026	0.008	0.010	0.017	0.021	0.012
Tools and appliances	0.004	0.004	0.019	0.014	0.016	0.003	0.018	0.003	.....	0.015	0.003
Operating expenses due to distribution in cents per kw.-hr. sold:											
Repairs and renewals:											
Lines and conduits	0.063	0.049	0.136	0.064	0.054	0.151	0.123	0.141	0.404	0.099	0.573
Meters, lamps and motors	0.010	0.006	0.030	0.042	0.009	0.078	0.056	.....	0.145	0.035	.....
Wages	0.484	0.006	0.176	0.210	0.116	0.131	0.136	0.113	0.148	0.314	0.249
Miscellaneous	0.194	0.001	0.214	0.22	0.078	0.013	0.243	0.073	0.192	0.213	0.168
Expenses of office management	0.251	0.052	0.547	0.500	0.34	0.315	0.623	0.098	0.484	0.524	0.246
Taxes	0.468	0.072	0.378	0.355	0.286	0.189	0.407	.....	0.530	0.500	0.560
Net operating income	1.942	0.364	1.400	1.533	1.114	1.159	1.966	1.153	2.925	1.637	2.221

*Operates hydroelectric and steam stations.

OPERATING EXPENSES FOR 1914 OF MASSACHUSETTS STEAM STATIONS OF AN ANNUAL OUTPUT OF MORE THAN 5,000,000 KW.-HR. (Continued)

	Malden	New Bedford	North Adams	Pittsfield	Salem	United Springfield	Worcester	Worcester Suburban	Average Values Excluding Boston Edison	Boston Edison
Type of prime mover	Turbines and engines	Turbines	Turbine and engine	Turbine, Diesel and steam engines	Turbines and engines	Turbines	Turbines	.....	.....	Turbines
Station equipment rating in kw	3400	11,550	2000	2990	4500	19,025	14,620	7730	.....	101,400
Output in million kw.-hr	10.06	6.28	5.25	5.04	9.18	26.91	30.03	6.86	.....	188.72
Cost of coal, dollars per ton	4.60	3.94	4.30	3.70	4.21	4.33	4.18	4.39	4.09	3.92
Coal per kw.-hr. in lb	3.16	3.86	3.34	*	2.71	*	.254	2.80	3.05	2.12
Population in thousands	44.40	96.65	22.00	32.12	43.69	88.92	145.98	.....	.....	670.58
Operating expenses due to station operation in cents per kw.-hr. made:										
Coal	0.642	0.680	0.638	*	0.511	*	0.474	0.364	0.570	0.373
Oil and waste	0.010	0.008	0.003	*	0.007	*	0.004	0.002	0.008	0.002
Water	0.057	0.039	0.069	*	0.017	*	0.001	0.001	0.022	3.011
Wages	0.184	0.437	0.204	0.416	0.166	0.137	0.104	0.092	0.216	0.150
Station repairs	0.005	0.030	0.021	0.013	0.009	0.015	0.035	0.002	0.018	0.006
Steam equipment repairs	0.059	0.051	0.062	0.075	0.054	0.044	.062	0.009	0.051	0.032
Electric equipment repairs	0.011	0.020	0.022	0.002	0.006	0.031	0.017	0.002	0.015	0.064
Tools and appliances	0.016	0.011	.....	0.007	0.008	0.003	0.001	0.012	0.008	0.018
Operating expenses due to distribution in cents per kw.-hr. sold:										
Repairs and renewals:										
Lines and conduits	0.446	0.494	0.035	0.138	0.113	0.079	0.158	0.076	0.170	0.315
Meters, lamps and motors	0.037	0.211	0.025	0.227	0.031	0.022	0.016	0.020	0.055	0.120
Wages	0.282	0.394	0.076	0.549	0.150	0.206	0.062	0.052	0.198	0.025
Miscellaneous	0.453	0.255	0.063	0.173	0.215	0.077	0.079	0.021	0.147	0.197
Expenses of office management	0.586	0.356	0.425	0.389	0.405	0.321	0.349	0.090	0.344	0.701
Taxes	0.443	0.441	0.180	0.305	0.287	0.312	0.198	0.059	0.314	0.602
Net operating income	1.887	1.898	1.412	1.848	1.212	1.664	1.592	0.918	1.492	2.314

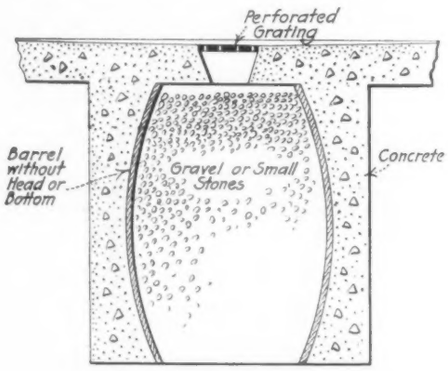
*Operates hydroelectric and steam stations.

by which is formed a network of oxide throughout the tin. The plugs showing deterioration of this type contained zinc in amounts varying from 0.3 to 4.0 per cent. It is shown that this type of oxidation is due to the presence of this zinc. The latter metal is not soluble in the solid state in tin, and when a tin with small amounts of zinc is heated as in a boiler to about 340 deg. Fahr. this zinc coalesces as a network enveloping the tin crystals or grains. The boiler water, particularly if it contains alkali, will attack the zinc, eating its way into the alloy along the zinc network, and finally form the oxide network described.

Lead and zinc are found to be the principal impurities in tin-plug fillings, and since all "failed" plugs contained these or other impurities, the conclusion is reached that if these impurities are eliminated by strict specifications and inspection, which will allow only admittedly superior qualities of tin such as Banca and some others, the danger of failure of these plugs will no longer exist.

Drains for Manholes

It is always advisable to connect manholes with sewers whenever possible so that any water in the manhole will run off at once. Where this is impossible, however, the following method of drainage was suggested in the report of the committee on underground construction at the recent meeting of the National Electric Light Association in San Francisco:

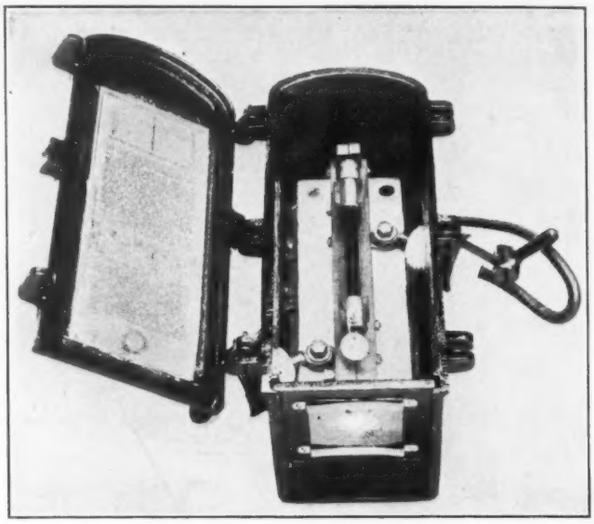


DRAINAGE PIT FOR A MANHOLE

Whenever excavating for the manhole a pit should be dug at the bottom somewhat deeper and larger than an ordinary flour barrel. In this pit a flour barrel without a top or bottom should be placed and the space between the staves and the surrounding earth filled with concrete. This concrete should be at least 3 in. thick. The barrel should be filled with gravel or small stones. The concrete foundation for the manhole may then be laid, so that the top of the barrel comes flush with the bottom of the manhole and may be covered by a suitable grate.

A Switch Designed to Exclude Insects

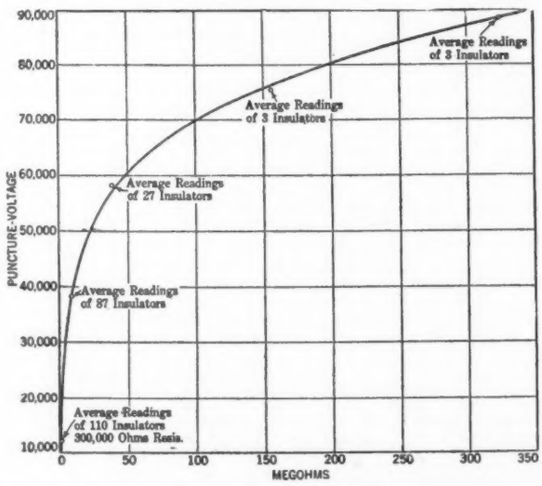
The Manila (P. I.) Railway & Light Company requires a special design of fuse box on pole lines to prevent insects from getting inside the box and building nests. The accompanying illustration shows a Matthews fuse switch constructed according to the company's regulations. As shown, the opening at the bottom of the box through which expelled gases are driven when the fuse blows is covered by a thin glass, which excludes insects but is so designed and arranged that it will instantly shatter at the time of the explosion and not retard the expulsion of the fuse and gases. This type of fuse box has been in service for the past four years and effectively overcomes any trouble with ants or other insects which infest inclosed devices on the company's system. Cast-iron boxes are preferred to wood boxes since the wood does not last well in the climate that prevails in Manila.



FUSE SWITCH WITH OPENING AT BOTTOM COVERED WITH GLASS, WHICH BREAKS WHEN FUSE BLOWS

Relation of Insulator Resistance to Puncture Voltage

In comparing the resistance of suspension-type insulators, as determined by a megger, with the puncture voltage, the Pennsylvania Water & Power Company, Holtwood, Pa., has found that the latter increases in a general way with the resistance. In fact, the ratio of puncture voltage to resistance followed very closely the curve shown herewith. Units having a resistance of about 50 megohms had a puncture value of about 60,000 volts, while those having a resistance of 350 megohms had a puncture voltage close to the flash-over value. It has been decided, therefore, not to allow insulators to remain in service on a 70,000-volt line unless each unit has a resistance of at least 500 megohms.



RELATION OF PUNCTURE VOLTAGE TO RESISTANCE

COMMERCIAL SECTION

The Typical House and the Testimonial

An Advertising Campaign at Louisville That Reduced the Wiring Offer to a Definite Human Issue

DURING six weeks of this year the Louisville (Ky.) Gas & Electric Company made use of testimonials in its general advertising. The plan was to select a typical residence, of one class or another, in which service had been established and then publish in the regular newspaper space a photograph of the house, a description of the installation and an indirectly quoted statement from the owner of the house to the effect that he was pleased with the installation.

Several objects were considered in this form of publicity. First of all, the personal—each man whose home was pictured and whose statement was quoted could be depended upon to have more or less influence on his neighbors and those with whom he came regularly in contact.

Second, the typical—as in most cities the residences in Louisville can be divided into classes, according to their character and dimensions. In reading the description of the installation in one house, with a statement of its cost and character, the owners of other, similar houses could read the answer to the questions uppermost in their minds. The picture of a house "like ours" would mean more than its description as a "four-room cottage."

Furthermore, permanency of impression was desired. Those who permitted the use of pictures of their houses and statements to the effect that they were delighted with the service had committed themselves and could be depended upon to continue to assert their satisfaction afterward, whenever they were asked for an expression thereof.

The Plan and the Cost

Though no attempt was made by the new-business department of the company to separate the responses which could be attributed to this particular advertising from those which came as a result of the work of the regular salesmen of the company or of Louisville contractors, it is stated that the plan "made good." The new-business department reports that in the six weeks there was an increase in the number of inquiries and contracts closed of approximately 20 per cent. This is to be considered in connection with the fact that the company's appropriation for advertising remained constant, the same amount of space being used in the local newspapers and the same advertising matter being employed on the backs of the regular monthly bills. The only difference in all of the various business-getting efforts of the company during that period and those which preceded or followed was in the character of the copy used in the newspaper advertisements.

Immediately before the series appeared the responses to the company's advertising had not been so good as normally, while discontinuance of the testimonials and use of another plan for another period was accompanied by a marked slump. The testimonial plan is therefore considered to have justified itself and will be used from time to time henceforth. The reason for discontinuance was that the company's management believes in varying the form of its appeal from time to time, not in continuing on one line until the novelty has worn off. The testimonial plan is one of the "good things" held in reserve, and will be made use of whenever the occasion seems opportune.

Details of the Advertising Schedule

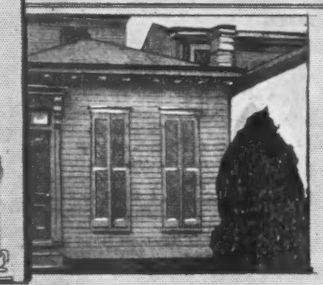
The advertisements were run one day each week in each of the five Louisville daily papers, four of which are English, two morning and two afternoon, while the fifth is a German morning daily. The copy and illustration occupying the regularly used space of the company would be placed in a morning paper on Monday. The same material would next appear in an afternoon paper on Tuesday. In the morning the German daily would have it; the following morning the other English daily, and on Friday afternoon the remaining afternoon paper. The proposition was in that way kept pretty well before the public for a week at the least expense, the space used being the company's uniform space, three columns wide, 10 in. deep, top of column next to reading matter, which is kept filled on a similar schedule throughout the year.

Additional cost of this form of appeal was represented by the cost of the photographs alone, $1.50 each, the newspapers carrying the advertising, under the contract, making the cut—the first paper to use the "ad" in each case being the one to have the picture engraved, the same cut then being passed around. In other words, the company spent only $9 more in six weeks for its advertising than it would have otherwise spent in newspaper advertising.

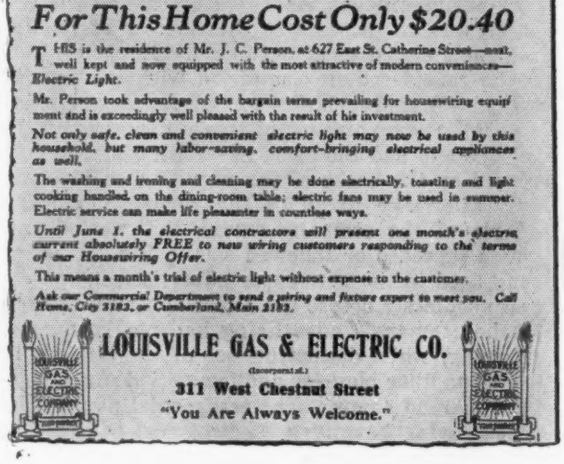
Selecting the Houses to Be Pictured

Selection of the subjects for these photographs was made with care. At one of the regular meetings of the salesmen for the company and the contractors of the city the advertising plan was discussed and a number of typical houses were agreed upon. Then the new-business department wrote a letter to the householder in each case, outlining the plan, making a complimentary allusion to the condition and appearance of his home, and asking for permission to use the photograph in the manner indicated, together with a statement as to the satisfaction given by the service. In every instance the house owners agreed to the request, usually cooperating gladly. The company further earned their good will by mailing them the original picture of the house. Several of those whose names were mentioned and whose houses were pictured later called on the company for an itemized statement as to the costs of their service, so that they could give detailed answers to those who called on them for particulars as to the cost of the service after once the installation was completed. To clinch the force of each advertisement it closed with

WEDNESDAY, APRIL 28, 1915. 9
Electrical Equipment
Makes Homes Thoroughly Modern
The above comfortable and attractive residence is that of Mr. J. A. Cicotte, at 622 West Ormsby avenue. It was recently equipped throughout for electricity, and Mr. Cicotte is well pleased with the installation.
This home represents one of the more elaborate installations out of the many thousands brought about by our Home Owners' Wiring Campaign. Residences of all kinds, from tiny one-story cottages to imposing mansions, have taken advantage of this splendid opportunity to modernize property at small cost.
In the Cicotte home there were put in place a 4-light shower fixture in the parlor, a dome fixture in the dining-room, a 1-light pendant fixture in the kitchen, 1-light pendant in bathroom, 2-light pendants in two bedrooms, 1-light fixture in another bedroom, three drop lights in basement, linen closet and attic, hall light and one pair of three-way switches, permitting hall light to be turned on from downstairs or upstairs, complete electric wiring and Mazda lamps—all for the cash cost of $65.93.
The value of this investment will never be lost as long as the house remains standing.
Until June 1, the electrical contracts will present one month's electric current FREE to new users who have their homes under the terms of our special offer.
Call Home, City 2182, or Cumberland, Main 2182, and we will send a representative to talk the matter over with you.
LOUISVILLE GAS & ELECTRIC CO.
(Incorporated)
311 West Chestnut Street
"You Are Always Welcome."



It cost just $20.94 to equip the six rooms of this modest but comfortable home for electric service. Mr. C. H. Deehne, the owner, 740 South Shelby Street, is well satisfied with the installation, which consists of one two-light shower fixture, two one-light chain pendant fixtures, three drop cords, complete wiring and Mazda lamps.
The Electrical Equipment
Helps to Rent or Sell Any Property
SHOULD Mr. Deehne wish to dispose of his home he will find a renter or purchaser much quicker that otherwise, as the result of his investment of $23.94 in this modern improvement.
The owner or tenant of the property will receive comfort, convenience and safety worth many times the annual interest at 6 per cent, amounting to $1.44.
Probably money could be invested in no way which will bring more in actual returns to each and every member of the household.
This cottage not only enjoys electric light with its cleanliness, efficiency and charm, but may use every kind of electrical, labor-saving device known to the most pretentious mansion. An electric flatiron, vacuum cleaner, toaster, table stove, washing machine, fan and innumerable other electric devices may be employed at small expense.
Don't you think that Mr. Deehne has invested his money wisely in electric wiring?
Our Home-Owners' Housewiring Campaign is proving even a bigger success than last year. Until May 1 the electrical contractors are presenting new customers with one month's electric current absolutely FREE as a means of stimulating business before the warm weather rush begins.
Our wiring experts are at your command for all information and estimates. Call Cumberland, Main 2182, or Home, City 2182, and we will send one to meet you.
LOUISVILLE GAS & ELECTRIC CO.
(Incorporated)
311 West Chestnut Street
"You Are Always Welcome."


Electric Wiring and Fixtures
For This Home Cost Only $20.40
THIS is the residence of Mr. J. C. Person, at 627 East St. Catherine Street—neat, well kept and now equipped with the most attractive of modern conveniences—Electric Light.
Mr. Person took advantage of the bargain terms prevailing for housewiring equipment and is exceedingly well pleased with the result of his investment.
Not only safe, clean and convenient electric light may now be used by this household, but many labor-saving, comfort-bringing electrical appliances as well.
The washing and ironing and cleaning may be done electrically, toasting and light cooking handled on the dining-room table; electric fans may be used in summer. Electric service can make life pleasanter in countless ways.
Until June 1, the electrical contractors will present one month's electric current absolutely FREE to new wiring customers responding to the terms of our Housewiring Offer.
This means a month's trial of electric light without expense to the customer.
Ask our Commercial Department to send a wiring and fixture expert to meet you. Call Home, City 2182, or Cumberland, Main 2182.
LOUISVILLE GAS & ELECTRIC CO.
(Incorporated)
311 West Chestnut Street
"You Are Always Welcome."

a bargain announcement of free service for the first month to those who had their houses wired before June 1.

One of the series of advertisements contained a photograph of the four-roomed cottage of Mr. J. C. Person, 627 East St. Catherine Street, a house typical in every way of hundreds to be found in Louisville. The wiring and fixtures of this house, it was set forth in all of the papers during the third week in April, cost only $20.40 cash. During the week this picture was used there were numerous telephone inquiries for a representative to call at a given number to "see about wiring a house like Mr. Person's." One man, a driver for one of the Louisville bottling plants, called at the office of the company, where he chanced to find somebody after closing hours.

"I've got a house just like this," he said, displaying a clipping of the Person "ad"; "if I can get it wired for what Person did, go ahead."

The details of the installation were explained to him and the character of the fixtures provided, and before leaving the office he signed the contract to have the wiring done. This was the regular proposition the company had been pushing for some time, a standardization of the fixtures, etc., for just such houses. It had always been in effect, but it took a picture of a house just like his own to drive home to the teamster just exactly what he could secure for this small sum of money.

Similarly, the home of Mr. C. H. Deehne is characteristic of a numerous Louisville type—one-story front and two-story rear, with six rooms in all. The net cost for wiring this house was $23.94, and Mr. Deehne was pleased to let the company say that he was well satisfied with the installation of one two-lamp shower fixture, two one-lamp chain pendent fixtures, three drop cords, complete wiring and tungsten lamps. A more elaborate installation was instanced in the case of Mr. J. A. Cicotte, 622 West Ormsby Avenue. This was a seven-room house, with the usual complement of halls, bath, basement, etc. It appealed to the owners of larger houses, built before the days of electric service and still lighted with gas.

The problem in Louisville has been not so much to impress upon the owners and occupants of old houses that electric lighting and electric service is a good thing as it has been to drive home to them the fact that it is available for everybody at a not excessive cost. With electric service it is difficult to make comparisons, since the quality of the service is so far beyond the character of that given by

gas or by kerosene lamps and since of late there has been no separation of fuel-gas and lighting-gas charges. The superior desirability of electricity, however, is appreciated generally, and the first cost is the obstacle that halts many. That was evident in many of the inquiries that followed publication of these particular advertisements.

"Please send a man to see my house," said one woman, "and see if I can get electric lights as cheap as Mr. Deehne. I was over there yesterday, after I saw the picture in the paper."

Generally, however, similarity of the house pictured to the house owned by the inquirer appeared to exert the most influence. Builders in the years following the war, when Louisville took a big spurt, seem to have had only half a dozen models. They built permanently, but without variety. So inquiries generally began: "My house is just like the Person house," or the "Deehne house," or "about the size of the Cicotte house." Then followed the request that an agent should call.

At the same time the company was working the regular house-wiring campaign with a good deal of vigor. Contracts were being signed at the rate of from thirty to seventy-five a week. The momentum of the campaign and the continued house-to-house efforts were getting results steadily, but the increase which accompanied the use of the testimonial series of advertisements is attributed to them. Two months after the series of advertisements was used the statement was made that a good fifth of the total volume of business was an increase and could be attributed to the testimonial ads.

Publicity for a Flatiron Campaign

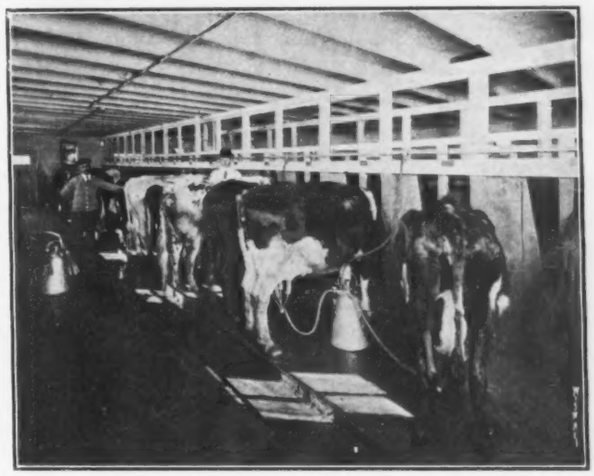
A campaign to sell 5000 electric irons in two months is being conducted by the United Electric Light & Power Company, New York City. As the company has only one appliance salesroom, special efforts are being made to gain wide publicity for the campaign, and to this end the electrically operated float shown herewith is being operated after nightfall through residence districts served by the company. The float carries a mammoth model of an electric iron complete in every detail, even to the cord and socket plugs. Lamps set in reflectors and supplied with energy from the vehicle storage battery illuminate both the iron and signs calling attention to the special-sale price and the location of the company's electric shop.

During the first five days of the campaign 250 irons were sold, or about one every ten minutes. If this record can be kept up or excelled, the irons will be sold in less than the allotted time.

AFTER-DARK ADVERTISING FOR AN ELECTRIC-IRON CAMPAIGN IN NEW YORK

Selling Electric Service to the Farmer

According to figures submitted by the Society for Electrical Development, there are 6,361,502 farms in the United States, on many of which electricity could be



TWO ELECTRIC MILKING MACHINES ON THE WALHURST FARM NEAR DENVER, COL.

used to advantage to minimize labor and to increase agricultural productiveness. That there is a large demand for power of some kind among these farmers is shown by the vast sales of gasoline engines each year by 400 manufacturers of internal-combustion apparatus.

"The farmers want power," points out Mr. John A. Randolph of the society, "or they wouldn't buy engines. They want light, or they wouldn't buy kerosene. Central-station men can make electricity supersede other forms of power on the farms as it has in the factories. It only remains for the central station to create a demand among the farmers as it has among factory owners."

Power customers can be more easily obtained after a line is built than before. It is natural for a man to want what he sees his neighbor enjoy. Hence when one customer in a farming community is connected up it is likely to be only a question of time before his neighbors will want service also.

Local advertising will produce results if it is of the right kind, continues Mr. Randolph. But such advertising should not describe apparatus and installations that are "above the heads" of the farmers. It should give costs, and its form of presentation should, moreover, appeal to all classes, including the man of limited means. It should be illustrated with pictures of typical farm installations of a kind suited to the territory covered.

Agricultural experts maintain that testimonials concerning what other farmers have accomplished are always more convincing than general facts stated by engineers. Farmers are proverbially skeptical, and they invariably want to know what "John Jones" over in the next county thinks about electric power, and what it has done for him.

Mixing Gas by Electric Power

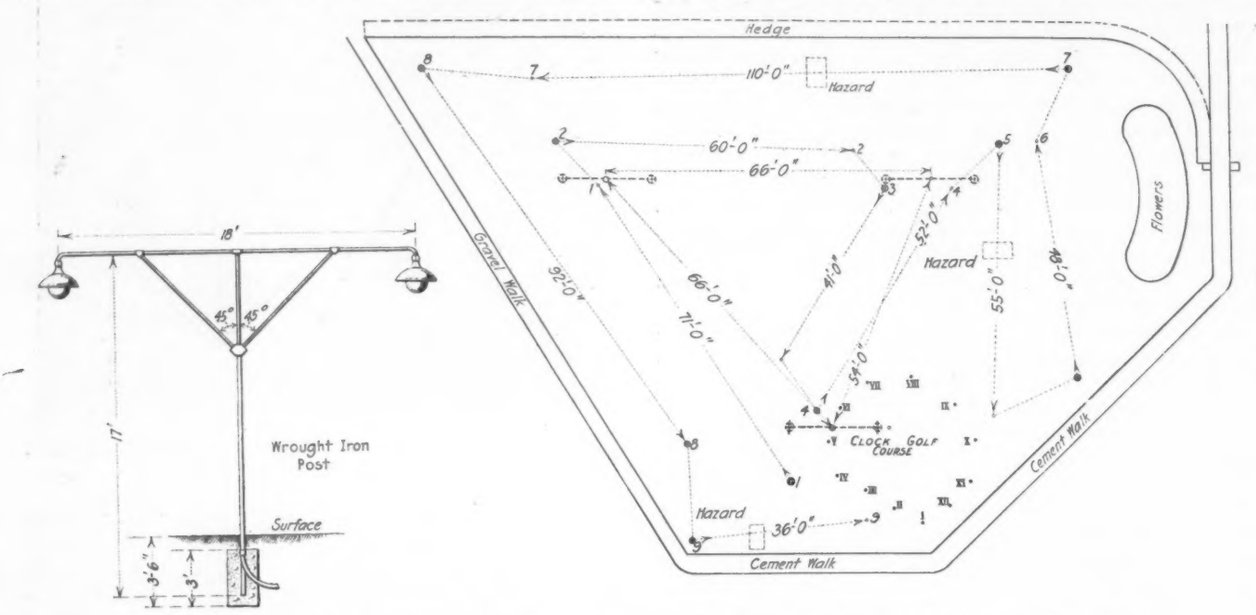
The Harrison Radiator Company, Lockport, N. Y., has installed an automatic machine to mix the proper proportion of air with the gas supplied to its soldering furnaces. Formerly each operator regulated his own furnace, but the results obtained were not uniform and considerable waste resulted. The new gas-mixer device is operated by a 5-hp. motor served from the lines of the Lockport Light & Power Company.

Electric Lighting of "Court" and "Clock" Golf Courses

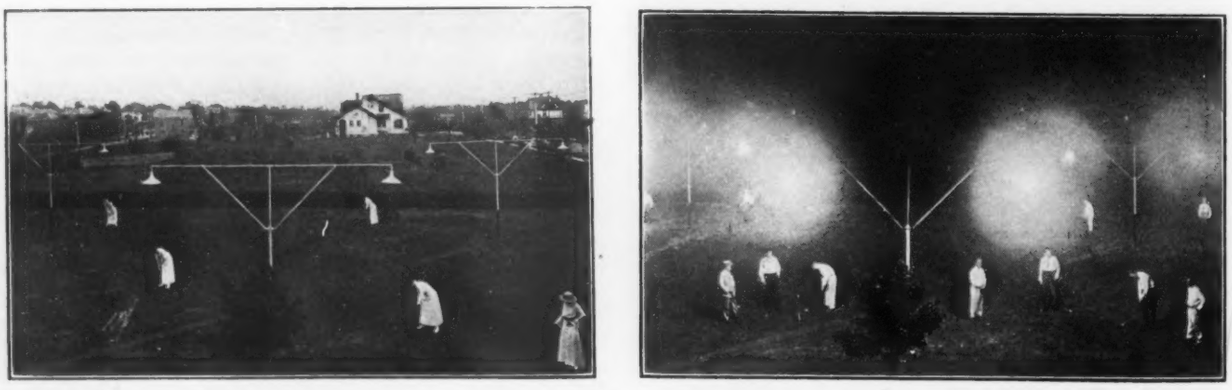
BY M. E. TRIMBLE

Electric illumination of the "court" and "clock" golf courses of the Fort Mitchell (Ky.) Country Club has greatly increased the popularity of the games with the members of the club. The courses were originally intended for the ladies and children of the club and became at once popular. The men who during the afternoon had been playing the regular game of golf on the links of the club would frequently stop at the smaller courses and play a round or two. It was found that the "clock" golf, which consists entirely in putting, and the "court" golf, which consists of an approach shot and then "holing out" with the putter, were of great benefit to the players of the regular game in improving their puts and approach shots. It, therefore, occurred to the writer that if he could install electric lighting on this course a great deal of pleasure could be derived by the members of the club after dinner, when there are always many on the veranda. The plans were drawn up, prints made and submitted to the board, voted on and accepted, and work was begun and the installation completed in fourteen days. The lamps were turned on one Saturday night, with many of the club members present, and it was interesting to note that artificial light conditions made apparently no difference in their game. The general opinion was that, if there was any difference at all, it was easier to play under the artificial light than in daylight.

The lighting was designed to give uniform illumination over the entire course regardless of the position of the holes. For this reason it was found necessary to change one hole, which was a trifle too near one of the poles. As shown in the accompanying illustration, three iron poles were installed, made of 2½-in. gas pipe, embedded in concrete 18 in. square and 3 ft. deep. The first nine feet of the pole is of 2½-in. pipe and the remainder of 1¼-in. pipe. The cross-arms are of 1¼-in. pipe and have a spread of 18 ft., the lamps hanging 14 ft. from the ground. The lighting units consist of six inclosed 750-watt tungsten lamps with special diffusing reflectors. The lamps are placed sufficiently high in the reflectors to prevent annoyance from glare to the people watching the game from the veranda. The writer has not had an opportunity to use the photometer, but believes the intensity at the various holes to be approximately 3 ft.-candles. As will be noted from the accompanying map, the greatest distance between tee and hole is on No. 7—110 ft. The ball, which is to be driven over a bunker and probably reaches a height of from 35 ft. to 50 ft., is visible to the eye during the entire flight; in fact, there have been times when the ball was driven 100 ft. off the course and no difficulty was experienced in finding it.



ARRANGEMENT OF LIGHTING FIXTURES ON COURSE OF FORT MITCHELL (KY.) COUNTRY CLUB



DAYLIGHT AND NIGHT VIEWS OF THE ELECTRICALLY LIGHTED COURT AND CLOCK-GOLF COURSES

NEW APPARATUS AND APPLIANCES

Automobile Searchlamp for Use with Dry-Cell Batteries

A searchlamp with a rating of 1 amp. at 6 volts has recently been developed by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa., for use with automobiles, motorcycles and motorboats. Various

ADJUSTABLE SEARCHLAMP FOR AUTOMOBILES, MOTORBOATS AND MOTORCYCLES

types of brackets are available for use with the lamp. When employed with automobiles, the lamp may be mounted on one of the doors or the windshield and can be employed not only as a searchlamp for reading signboards and illuminating the road at turns and for backing, but also as an auxiliary headlamp in cases of emergency. For use on motorboats the outfit includes an extra bracket for mounting the lamp in the cabin when it is not required as a searchlamp. The device is also well adapted for use on trouble wagons, and for this purpose two brackets are provided, one for mounting on the dashboard and another for use on the ground or wherever needed. Use is made of a 6-volt tungsten lamp, making the outfit available for 6-volt lighting systems as well as ordinary dry cells. The searchlamp is equipped with a focusing lens and an 8-in. parabolic reflector.

Spacing Switch Boxes

In the accompanying illustrations are shown switch boxes provided with ears which can be raised or lowered a certain distance, as desired. For installing the boxes in gangs two sides are removable. In Fig. 1 is shown a single box, and in Fig. 2 three boxes with sides removed and serving as one continuous box are illustrated. When the boxes are placed in gangs the ears are bridged as shown in Fig. 2. The ears employed for bridging the boxes are provided with short and long projections. In the illustration the ears shown in the front of the box are attached to the boxes with the short projections and on the other side of the boxes are attached with the long ears. The sides are removed from the boxes when ganged by holding the box upside down and striking the bottom of the edge of the side to be removed at point indicated on all boxes by the stamp "To open hit here." The boxes are being made by the Wm. Wurdack Electric Manufacturing Company, St. Louis, Mo., for which W. Douglas Woolley, 30 North Michigan Boulevard, Chicago, Ill., is general sales representative.

FIGS. 1 AND 2—SINGLE SWITCH BOX, AND GANG OF THREE BOXES

Electric Deep-Well Pump

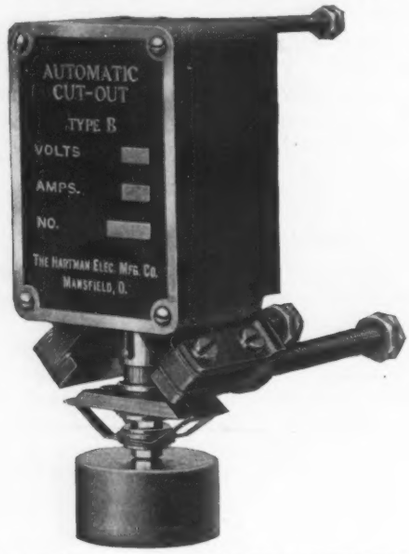
The motor-driven pump shown herewith is designed to operate with 2-in., 2.5-in. or 3-in. single-acting cylinders and to raise the water to a total height of 180 ft., 125 ft. or 90 ft. respectively. The machine is wholly self-contained, and all parts are well constructed. The gears are machine-cut and are shielded. The outfit can be employed in connection with open or elevated tank systems or with closed tank pneumatic-pressure systems. When employed with the pneumatic-pressure system, an air pump is provided to furnish air to the tank through the water discharge. Water is raised on the up stroke while air is forced in on the down stroke, thus equalizing the pressure. The pump is operated by a 0.75-hp. single-phase motor, which is mounted rigidly on an extension of the pump support. The motor is made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., and is designed to start the pump under full load.

MOTOR-DRIVEN DEEP-WELL PUMP

Automatic Switch for Small Generating Outfits

The Hartman Electrical Manufacturing Company of Mansfield, Ohio, has recently brought out an automatic switch for small-generating plant boards. The switch has a rating of 100 amp. and is designed for use with 32-volt, 65-volt and 110-volt systems. The automatic switch, or cut-in and cut-out switch, as it is often called, renders unnecessary all hand manipulation of switch on small-plant boards. It automatically cuts in or connects the generator with the line whenever the voltage is high enough to charge the battery, and in the same way it automatically cuts out on reversal of current. Use is made of a laminated brush for the main contact, which

is protected by an auxiliary or arcing contact. These contacts are mounted directly on the moving core or armature, and as long as the generator voltage exceeds the battery voltage they are held firmly in contact with the stationary blocks. Adjustment for the exact cut-in and cut-out voltage is made by means of a weight at-



AUTOMATIC CUT-OUT SWITCH FOR SMALL GENERATING SETS

tached to the lower end of the solenoid core, which is said to open the contacts with a quick break when a reverse in current takes place. The contact blocks are integral with the studs. The studs serve the double purpose of carrying the energy and affording means of mounting the switch on the panel. It is necessary to drill only three holes in the panel for mounting the switch. The positive leads from the generator and battery respectively are brought to the lower studs, and the negative leads are interconnected and brought to the upper studs.

Electrostatic Potential and Synchronism Indicators

Electrostatic vacuum lamps or "glowers" for indicating the potential on high-voltage alternating-current circuits and determining when such circuits are in synchronism so that they may be thrown together have been developed by the General Electric Company, Schenectady, N. Y. For showing the voltage the two appliances illustrated in Figs. 1 and 2 are employed. The first device consists of an electrostatic "glower," a metallic condenser hood, a switch for cutting the glower in and out of the circuit, and a hook for suspending the indicator from the line and conveying energy to the glower. One terminal of the glower is connected to a spark-gap and then to the lower end of the suspension hook; the other terminal is connected to the condenser hood. The loop in the suspension hook enables the indicator to be hung over the line by means of the ordinary type of switch hook used for operating disconnecting lever switches.

The indicator switch when closed provides a low-resistance path between the line and the hood and cuts the glower out of the circuit. When the switch is open the glower is connected between the line and hood through the spark-gap, and it will light up if the potential of the line is equal to the tension between the line and ground on a 15,000-volt, three-phase system. This indicator is used for indoor and outdoor service and, as a rule, hangs on the line continually, but, of course, can be moved about as desired. Usually a grounded wire is connected to the switch string sufficiently close to the hood to be out of reach of the operator.

Another form of indicator, shown in Fig. 2, is essentially the same as that described above, except that no switch is provided and the hood is attached to a long wooden rod equipped with a ground cone for connecting a wire between the rod and ground. The upper terminus of the lead running down to the spark-gap inside

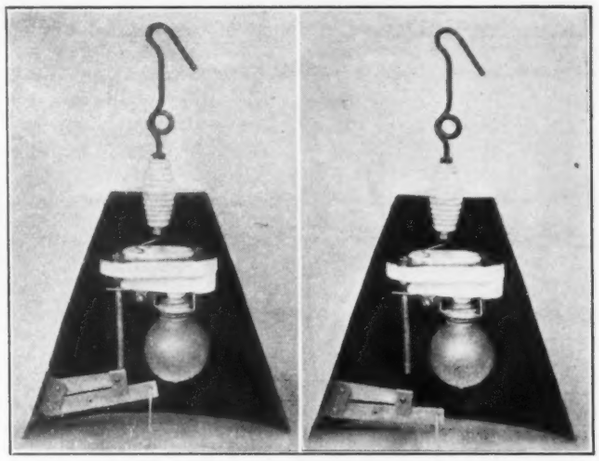
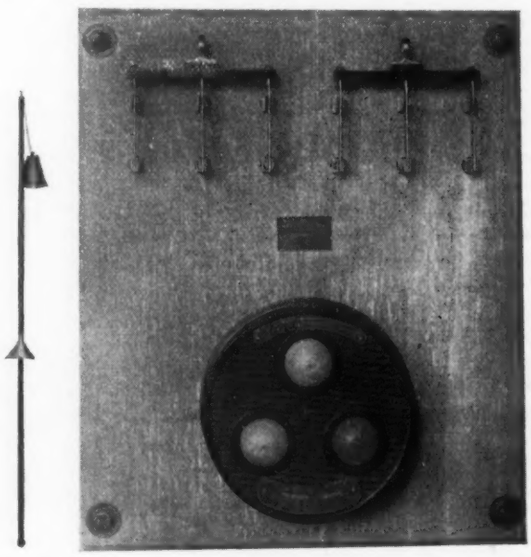


FIG. 1—CROSS-SECTION OF VACUUM-LAMP-TYPE ELECTROSTATIC POTENTIAL INDICATOR, SUSPENSION DESIGN

the hood is connected to another lead going to the top of the pole to a metal pin, which is held against the line to determine whether the line is alive. This indicator is, because of its easy portability, most suitable when the indication of potential may be desired on a number of lines.

In Fig. 3 is shown an electrostatic synchronizer made by the General Electric Company for use in main stations where energy is metered on the low-tension side, in switching stations, line-junction stations and some substations. Three electrostatic glowers, mounted in a case, which resembles that used for a round-pattern



FIGS. 2 AND 3—PORTABLE ELECTROSTATIC POTENTIAL INDICATOR AND GLOW INDICATOR AS SYNCHROSCOPE

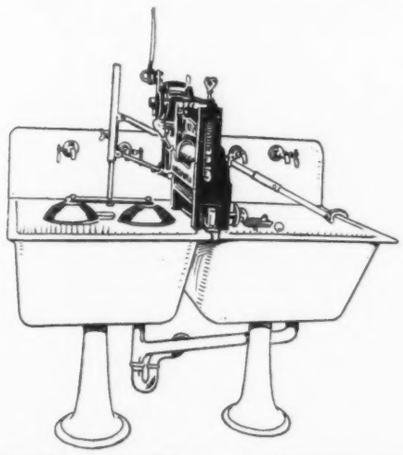
switchboard instrument, are used. The glowers are connected to the line through condensers consisting of suspension insulators, the insulating value of which is at least equal to that used for insulating the line. To use the synchronizer the terminals of one of the glowers

are connected through the insulators to the leads of the same phase of running and incoming lines. Each of the other glowers is connected across dissimilar phases of the remaining leads of the running and incoming lines. When the lines are not in synchronism the glowers will indicate the relative frequency of the lines in the same manner as the usual synchronizing lamps. When in synchronism the rotating effect will disappear, the glower connected to the corresponding lines will be dark, and the other two will show about one-half brilliancy. The minimum voltage for operation is 13,200, and the maximum depends only on the use of the proper number of insulators.

The synchronism indicator can be used as a ground detector by connecting one terminal of each glower to the ground and the other terminals to the line. A lighted glower will indicate that the line is not grounded.

Electric Washer for Mounting on Stationary Tubs

An electrically operated washing machine which is equipped with vacuum cups and which may be attached to stationary tubs, as shown herewith, is being placed on the market by the Kelman Electric & Manufacturing Company, 1650 Naud Street, Los Angeles, Cal. One operating handle is utilized to govern the action of the wringer and the washer. To reverse the wringer use is made of a four-point attachment plug. By reversing the machine electrically instead of mechanically, considerable gearing is eliminated. The mechanism is inclosed and a safety-pressure release on the wringer is provided whereby pressure can be instantly removed

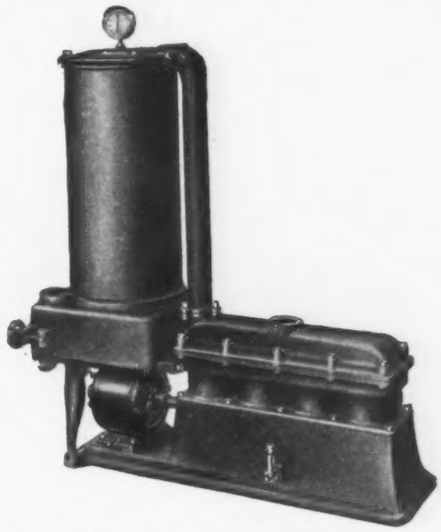


WASHER ATTACHED TO STATIONARY TUBS

from the wringer roll. The mechanism is of the worm-and-gear type and runs in ball bearings. Ample provision is made, it is declared, for lubrication. By loosening a thumb screw, the motor may be removed and used for other purposes.

Stationary Vacuum Cleaner

The vacuum cleaner illustrated herewith has recently been developed for residence service by the Palm Vacuum Cleaner Company, Detroit, Mich. Instead of the rotating fan commonly used to provide the vacuum, the outfit is equipped with a four-cylinder vertical-plunger vacuum pump which is directly connected to the motor. On a closed system the pump will provide a vacuum of 7 in. of mercury, it is claimed, and the air displacement at the end of the hose will be 50 cu. ft. a minute. The outfit is equipped with an automatic lubricating system and needs attention only once or twice a year. Use is made of a collapsible self-cleaning bag and removable dust-pan. The set is compact and all moving parts are inclosed. One pipe connection only is required, and it is not necessary to bolt the machine to the floor. The

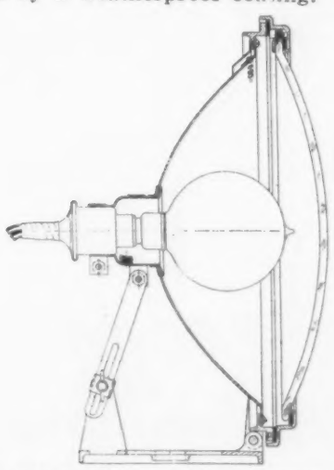


STATIONARY VACUUM-PUMP CLEANER FOR RESIDENCES

cleaner is operated by a 0.5 hp. direct-current or alternating-current motor made by the Robbins & Myers Company, Springfield, Ohio.

Flood-Lighting Projector

A device for projecting a beam of light from a distance onto signs, buildings, statues, etc., has recently been developed by the Edison Lamp Works of the General Electric Company, Harrison, N. J. The flood-lighting projector, as it is called, consists of a highly polished aluminum parabolic reflector, 1/16 in. thick and 16 in. in diameter, mounted in an iron frame. The front of the reflector is covered with a piece of round heat-resisting glass, which is clamped to the reflector frame and packed in such a manner that the whole is weatherproof. All exposed parts are of non-corroding metal or are protected by a weatherproof coating. The projector is so designed that cooling air enters near the base of the incandescent lamp, circulates around its stem and bulb, and then passes out at the front edge of the top of the reflector. A 500-watt focus-type nitrogen-filled lamp is employed with the projector. The spread of the

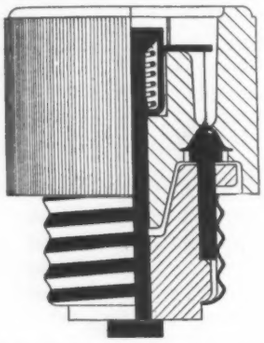


SECTIONAL DIAGRAM OF FLOOD-LIGHTING PROJECTOR

beam can be controlled by moving the lamp in and out of focus, and the manufacturer points out that the beam may be concentrated to about 6 deg. divergence with an apparent candle-power in the center of slightly over 400,000 by placing the filament exactly at the focus, or, by drawing the filament behind the focus, the beam may be spread to 18 deg. with an apparent candle-power of approximately 150,000 in the center of the beam. The entire outfit weighs about 30 lb.

Improved Six-in-One Fuse Plug

Certain improvements have been added to the six-in-one fuse plug described in the ELECTRICAL WORLD of Nov. 7, 1914, which is now being placed on the market by the Atlas Selling Agency, 450 Fourth Avenue, New York. The device consists of two parts. The upper revolving part contains six chambers for six separate fuse wires which can successively be brought into contact with a contact stub which is soldered to a metal screw shell cemented to the lower rigid part of the plug. When one of the fuses burns out it is only necessary to pull slightly the rotating part, which is held in place by the spring shown in the sectional drawing herewith, and turn it to the right until the next fuse snaps into place. This operation can be repeated six times. In



SIX-IN-ONE FUSE PLUG, ACTUAL SIZE

the accompanying illustration is shown a drawing of the plug of actual size. The sectional part of the illustration shows how the rotating part overlaps the stationary part instead of the latter overlapping the former as in the old arrangement. Thus in its new form a flash would be directed downward instead of upward.

Inclosed Fuses

The fusing element of the fuses shown herewith consists of three parts, the two "lead-in" strips on the ends as shown in Fig. 2, and the fuse proper between these strips. The central part of the fuse element consists of several round wires which are drawn

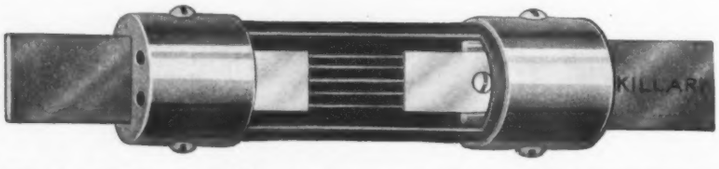


FIG. 1—SECTION OF 100-AMP. FUSE SHOWING FUSIBLE ELEMENTS

through a die and are therefore accurate and enable one to determine the rating of the fuse very closely. With an ordinary overload the central portion of the element or the round wires is the only part that "blows." Where the short-circuiting current is large, the lead-in strips, which are also of fusible material, melt away, thus increasing the arcing distance and making it easier to extinguish the arc. By employing several wires, several small arcs are produced, so that it is easier to extinguish the arcs than if only one large

FIG. 2—OUTSIDE VIEW OF 60-AMP. FUSE

arc was made. Fuses with ratings up to 600 amp. for pressures of 250 volts and 600 volts of the type described above are being made by the Killark Electric Manufacturing Company, St. Louis, for which W. Douglas Woolley, 718 Michigan Boulevard Building, Chicago, Ill., is general sales agent.

Electric Vacuum Cleaner

A motor-driven electric vacuum cleaner of rather low price, weighing 10 lb., has recently been placed on the market by the Ramey Company, Chillicothe, Ohio. The machine is operated by a universal motor of Robbins & Myers manufacture. The height of the machine is 6.25 in., the nozzle width 13 in., and the nozzle breadth 1⅞ in. The position of the nozzle can be adjusted by raising or lowering the rear castor. The switch is at the end of the handle and is of the General Electric pistol-grip type. The attachments for use with the vacuum cleaner include 8 ft. of reinforced cotton-covered hose, a hose connector for suction and blowing, a nickel-plated extension tube to connect hose and tools, a nozzle for curtains, mattresses, pillows, etc., a brush for cleaning clothes, curtains, cushions, etc., and a blower nozzle.

10-LB. MOTOR-DRIVEN VACUUM CLEANER

CURRENT NEWS SECTION

Naval Advisory Board May Be Enlarged

Several of the scientific societies which Secretary of the Navy Daniels has asked to nominate members of the proposed Naval Advisory Board have sent their selections to him. It is stated at the Navy Department that the personnel of the board will not be made public until all the names have been received and decided upon.

Some additions will be made to the list. The board will not be limited to two members from each of the eight societies which Mr. Daniels has consulted. It is said to be more than likely that Mr. Daniels will ask several other societies for nominations. He is considering the advisability of asking the American Institute of Chemical Engineers and the American Electrochemical Society to nominate members. Mr. Daniels has been told that electrochemists have done more for the development of American industries than all other chemists together, and that if the American Chemical Society is asked to nominate members, as it has been, the Institute of Chemical Engineers and the American Electrochemical Society should also be included. He therefore has these societies as well as others under consideration.

Letter of Rochester Section, A. I. E. E.

Mr. John C. Parker, chairman of the Rochester Section of the American Institute of Electrical Engineers, has written a letter to members of the board of directors, past-presidents and chairmen of sections concerning the appointments to the Naval Advisory Board. The executive committee of the section desired to place a memorandum before those who are considering the appointments and "to suggest an interchange of ideas so as to get some unanimity of philosophy if not of specific choice." The letter says:

"It seems to us that at the present juncture the great national scientific and professional societies have an opportunity to render service to the nation with credit to their professions, and that such opportunity calls for the most sober and careful choice. The Rochester Section will, in its nominations, be guided by the following considerations:

"1. Research work in pure or applied science will be well taken care of by men nominated from the chemical and physical societies.

"2. There is no possible service on the Naval Advisory Board for central-station men or men engaged primarily in executive work.

"3. The character of the work to be expected from the board is rather the work of designers than of consultants.

"4. In addition to the qualifications of the individual nominees, it is our judgment that we should consider the indirect, though very large, benefits to be derived from the character of their normal vocation.

"5. Specifically, we believe that men engaged in the broad phases of design work in large manufacturing organizations would be able to bring to the advisory board the experience of such organizations and would at the same time be able to secure quickly for the country's needs such manufacturing facilities as might prove necessary.

"6. In order to obtain the widest distribution of these appointments, we feel that our nominations should cover men engaged with different manufacturing concerns and men whose work represents diverse specialties such as will complement one another."

Letter of Inventors' Guild

Mr. Thomas Robins, secretary of the Inventors' Guild, has written to members regarding the meeting held in New York on July 27, when, as stated in last week's issue of the ELECTRICAL WORLD, a resolution proposed by Mr. Frank J. Sprague for the appointment of two members for the Naval Advisory Board was passed. Mr. Robins says in part:

"Although the proposed committee has been variously referred to as the Naval Advisory Board, the Naval Advisory Committee of Invention and Development, the Naval Board of Inventors, etc., it is the opinion of our members who were present at the meeting that the duties of this body will lie not so much in the actual invention of plans and devices as in advising the Navy Department concerning such technical matters as may be submitted for its consideration, assisting in the investigation and development by the Navy Department of such matters as are deemed worthy of consideration, obtaining for the department the assistance of the most competent men in any special technical branch, assisting the department in obtaining from Congress such appropriations as may be required, in offering a trained and receptive ear to inventors—in short, to form an effective professional connecting link between the people of the country and its trained military experts. It is probable that some arrangement will be made whereby the services of the board will be at the disposal of both the army and navy.

"The probable duties of this board as thus outlined make it desirable that its members shall have had experience in passing upon schemes and inventions and in their development, that they shall have been trained in the co-operation and team play required in committee work, and that they are willing and able to devote to their duties such an amount of time as the exigencies of the occasion may require. Members of the board will serve without pay, but it is expected that some arrangement will be made to reimburse them for actual traveling expenses."

Franchise Negotiations in Louisville

The application of the Louisville Gas & Electric Company for a franchise to enable it to operate freely in Jefferson County outside the city of Louisville has been delayed in the fiscal court while amendments are being made. These specify maximum rates for electrical energy and were explained at a recent meeting of the court by Mr. Donald McDonald, vice-president and general manager of the company. Included is a provision that should the county desire to light country roads energy would be supplied at 5 cents per kilowatt-hour, subject to 5 per cent discount if bills are paid on presentation. No country subscriber shall be required to pay more than 2 cents per kilowatt-hour higher than city subscribers pay for the same service. The franchise provides for extensions of gas mains in the county.

Convention of Jovian Order

The thirteenth annual convention of the Jovian Order will be held at the Hotel Sherman, in Chicago, Oct. 13, 14 and 15. A general committee composed of Messrs. Homer E. Niesz, chairman, Victor H. Tousley, vice-chairman, G. W. Cummings, secretary, and the following members, chairmen of the sub-committees named, have been placed in charge of the arrangements:

Entertainment, Mr. George H. Porter; transportation, Mr. L. W. Kittman; registration, Mr. Ell C. Bennett; program, Mr. Victor H. Despard; decoration, Mr. Stephen Gardner; ladies', Mr. Fred P. Vose; finance, Mr. John F. Gilchrist; badge, Mr. A. L. Eustice; hotel, Mr. Morgan P. Ellis; publicity and promotion, Mr. A. A. Gray; rejuvenation, Mr. George C. Richards; automobile, Mr. G. A. Freeman; reception, Mr. Ray Palmer; membership, Mr. Earl W. Donoho; printing, Mr. G. M. Swain.

The program outlined includes a reception and dance on the evening of Oct. 12. On Oct. 13 there will be a business session in the morning, a luncheon in the afternoon, when the Jovians will be the guests of business associations of Chicago, followed by an outing and an elaborate pageant and entertainment in the evening. A business session is scheduled for the morning of Oct. 14, and the degree-team competition will take place in the afternoon. The annual rejuvenation will be held that evening. On Oct. 15 there will be a business session in the morning, a closing session and election of fourteenth congress in the afternoon, and a banquet in the evening. Special provision is being made to entertain the visiting ladies.

Meeting of N. E. L. A. Executive Committee

A meeting of the executive committee of the National Electric Light Association was held at the headquarters in New York on July 30. The committee re-elected Mr. T. C. Martin secretary, Miss Harriet Billings assistant secretary and treasurer, and Mr. E. W. Burdett general counsel.

The committee approved a suggestion of President Lloyd for the appointment of a committee on geographic sections, the idea being that the chairmen of the sections would compose the personnel of the committee, which would meet to discuss matters of interest to the sections. Mr. Lloyd said that he would appoint the committee.

Manufacturers and Proposed Hydroelectric and Technical Sections

Some discussion took place on the proposed manufacturers' section. Mention was made of the work of manufacturers in the American Electric Railway Manufacturers' Association and in the Society for Electrical Development, Inc. It was voted to advise the manufacturers that they should make formal application to form a manufacturers' section and to ask them to draw up a constitution and submit it to the committee on constitution and by-laws. Mr. Lloyd referred to the tendency to divide the association into sections, mentioning the Accounting Section and the Commercial Section. He spoke of the meeting held during the week by Past-president Scott with chairmen of the technical committees to discuss the advisability of the organization of a hydroelectric or technical section. Mr. Scott reported that it had been decided at the meeting to ask permission to organize a hydroelectric and technical section and that formal application would be made in the near future. Mr. Scott said that it had been suggested at the meeting that the chairman of the section be chosen from the chairmen of the technical committees and that two vice-chairmen should be elected in the same way.

Chairman H. M. Edwards of the Accounting Section suggested that the association apply for representation in the National Association of Railway Commissioners. Mr. Edwards explained that one of the aims of the Accounting Section is to work for the establishment of a national classification of accounts to be brought about by the concerted action of the Interstate Commerce Commission, the various State commissions and the N. E. L. A. This could be aided considerably if the association had representation in the Association of Railway Commissioners, in which both the Society of American Railway Accounting Officers and the American Electric Railway Accountants' Association are represented. It was voted to apply for this representation.

Boiler Code of Mechanical Engineers

Mr. I. E. Moultrop, chairman of the prime movers committee, met with the committee at this point. A letter sent by Mr. Moultrop to the executive committee was read. This explained that the American Society of Mechanical Engineers had issued its standard specifications for the construction of steam boilers, and that the society had decided to stop there and allow other organizations to carry on the work of securing the adoption of this code by various States. The American Boiler Manufacturers' Association has taken up the work and organized a committee representing practically all of the various associations of boiler manufacturers and insurance companies insuring boilers, etc. It is desired to have users represented by a member appointed by the N. E. L. A. Mr. Moultrop recommended that the N. E. L. A. approve the action of the boiler manufacturers' association in the work of securing general adoption of the code and appoint a representative to serve on the committee of that association. This representative will not take part in any legislative work. The recommendations of Mr. Moultrop were adopted and it was voted to leave the appointment of a representative to President Lloyd.

President Lloyd referred to a letter which he had received from Mr. W. H. Atkins and asked Mr. Atkins to explain his suggestion. Mr. Atkins replied that it had occurred to him that the year 1915 might be devoted entirely to commercialism and commercial engineering and that, outside of what the Commercial Section has done, very little attention has been devoted to this subject. Mr. Lloyd added that engineers could assist commercial men very materially, and that it would be a distinct advantage for them to co-operate. The matter has already been referred to the Commercial Section, which indorses it heartily, and it will be referred to the new hydroelectric and technical section.

New Members

Applications for Class A membership from thirty-four companies, for Class B membership from the Federal Engineering Company of Toronto, and one for foreign membership from Iwaichi Notomi of Japan, were received. The committee elected 256 Class B members, fourteen Class E members and, as Class C members, Mr. Charles F. Leonard, New York Public Service Commission, Second District, and Mr. Theodore Dwight, Society for Electrical Development, Inc. The California-Oregon Power Company, Medford, Ore., and the Great Western Power Company, Sacramento, Cal., were authorized to form company sections.

The question of the participation of the association in the selection of the Naval Advisory Board proposed by Secretary Daniels was discussed. It was voted to authorize President Lloyd to communicate with the proper authorities and offer the services of the association in any way which the army and navy may need.

Mr. Lloyd spoke of the relations of the association with the Bureau of Standards and of the special committee appointed a few months ago, consisting of Messrs. W. H. Blood, Jr., chairman, R. J. McClelland and S. G. Rhodes. He asked Mr. H. A. Wagner to serve on the special committee, and Mr. Wagner said that he would be glad to do so.

Mr. Lloyd called attention to a number of invitations from various authorities in different cities for the next convention. Invitations were received from Pittsburgh, Cincinnati, St. Louis, Mo., New Orleans, Atlantic City, New York, Baltimore, Salt Lake City, Saratoga and Detroit. After discussion the list was narrowed tentatively to Pittsburgh, Atlantic City, New York and Baltimore. Messrs. Scott and Neumuller were appointed to confer with Secretary McConnaughy of the exhibition committee in order to ascertain what might be required for exhibits and what the preferences of the committee are, with the understanding that they will report to the executive committee at the next meeting.

The secretary presented a formal invitation from the Secretary of State regarding the participation of the association in the second Pan-American Scientific Congress.

Work of Canadian Association

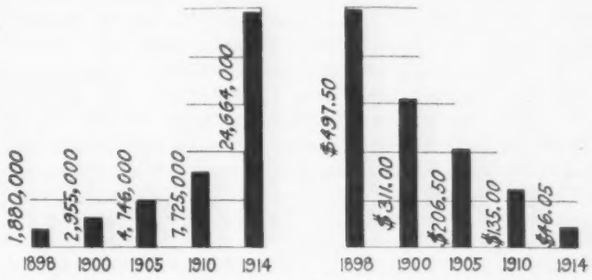
Secretary Alan Sullivan of the Canadian Electrical Association made an interesting statement in regard to the work which that society has been undertaking during the last year and more particularly since the outbreak of the European war. He showed that the government has intrusted large powers to the association as the representative of the electrical industries in Canada as a whole, particularly in regard to accident prevention and workmen's compensation. Mr. Sullivan also went into details concerning the plan of joint purchase of materials and supplies, which is working now very effectively, including such apparatus as lamps, transformers, motors, etc. The association is also giving attention to the question of municipal assessment in regard to general taxation. This work is similar to that proposed by Mr. John A. Britton in connection with the investigation of taxation in the United States of public utilities as compared with other property. The committee thanked Mr. Sullivan for his suggestive survey.

Troubles of Seattle Municipal Lighting System

In a recent communication to the Seattle City Council Mayor Hiram C. Gill advised that not another dollar be spent in connection with the Cedar River Reservoir of Seattle's municipal lighting plant, which so far has failed to hold water, until it is known what it is being spent for and the probable results that will be obtained. This recommendation was made in connection with the request of the Chamber of Commerce, the Municipal League and the Pacific Northwest Society of Engineers. The Mayor urged that a board of five engineers be employed to investigate and report on the best method or methods to be adopted in order to make the basin back of the fifteen-hundred-thousand-dollar dam available for use. Hs also recommended that bids be solicited for furnishing electrical energy with a view to abandoning the operation of the Lake Union steam plant in Seattle, if the energy can be bought at a lower cost than it can be developed for by the use of oil fuel. Referring to the purchase by the city of the Elwha power project on the Elwha River, the Mayor expressed the belief that it can be purchased at a price that will insure energy at a lower cost than by the operation of a steam station.

Report on Chicago Street-Lighting Costs

In his annual report as commissioner of gas and electricity for the city of Chicago during 1914, just issued, Mr. Ray Palmer presents detailed costs of the various types of street lamps in service in the city last year. The total number of such street lamps averaged 23,047 for the year and included arc lamps of older and newer types, as well as about 5700 nitrogen-filled tungsten



TOTAL CANDLE-POWER SUPPLIED AND COST PER 1000 CP.

lamps. The itemized costs for each type of lamp which was installed during the year are shown in tabular form herewith. It will be noted that the figure for renewals of the 300-watt gas-filled lamps is low during the year, since at the close of the year all of the lamps had not been in service for their full renewal period. The present cost figure will therefore be increased by about

DETAILED COSTS OF CHICAGO STREET LIGHTING, 1914

	Arc Lamps			Incandescent Lamps	
	Open Direct-Current	7-Amp. Inclosed Alternating-Current	Flame	4-Amp. Series Tungsten	300-Watt Tungsten
Average number of lamps operated	935.7	6253.6	10,168.9	4920.9	767.4
Sanitary District energy	$10.03	$10.03	$10.34	$1.77	$7.14
Substation operation	0.98	0.98	1.01	0.17	0.70
Carbons or renewals	4.83	0.78	6.72	0.45	4.61
Globes	0.50	0.43	0.60	0.37	0.14
Repairs to lamps	2.38	1.87	1.73	.....	0.13
Trimming, cleaning and patrolling	15.52	7.82	7.38	2.77	4.74
Repairs to circuits, conduits and posts	4.66	4.66	4.66	4.66	4.66
Miscellaneous expense, including street-car fares, etc.	0.13	0.17	0.17	0.02	0.07
Supervision (office expense)	0.35	0.35	0.35	0.35	0.35
Total	$39.38	$27.09	$32.96	$10.56	$22.54
Fixed charges	11.80	11.58	28.80	13.99	17.00
Total	$51.18	$38.67	$59.76	$24.53	$39.54

$3 per year under present conditions, although the future tendency will, of course, be toward a reduction due to decreased cost of the lamps and to increased life per lamp. Under the items of fixed charges in the accompanying table are included ground rent, office rent, taxes, depreciation, interest on investment, and a proportion of other departmental salaries.

A. I. E. E. Standardization Rules

The American Institute of Electrical Engineers has brought out a revised edition of the standardization rules recommended by the standards committee and approved by the board of directors. This edition represents the completion and clarification of the edition of Dec. 1, 1914, with some important additions. In order to obviate the confusion that would result from continued use of the old edition, it has been suggested that the latter be destroyed, as soon as the new edition, which can be obtained free, is received.

United States May Purchase Hammond Patents for Radio Control of Torpedoes

From Washington it is reported that the War Department will urge Congress to purchase the patent rights of John Hays Hammond, Jr., for his invention for the control of boats and submarine torpedoes by radio impulses from shore stations. Mr. Hammond has 102 United States patents on such an invention, which is pronounced by Brig.-Gen. E. M. Weaver, chief of the United States Coast Artillery, to be a practical device. In a report General Weaver said:

"Mr. Hammond has worked out the details of radio control so as to make it possible to apply it in the form of a spar torpedo to a motorboat. His further experiments point to a satisfactory solution of the problem of applying his equipment to a submerged torpedo under radio control from shore. The distance at which this control is exercised is limited only by distinctness of vision aided by telescopes."

Hydroelectric Development Hampered

The project to develop hydroelectric energy near Summer and Abert Lakes in Oregon is discussed in a letter received by Mr. Jason C. Moore, Portland, Ore., who has been trying to carry it through, from Mr. F. G. Sykes, president of the American Power & Light Company. Mr. Sykes said:

"I regret to say that we have not been able to find any suitable powers of the magnitude you require which are not involved in fatal complications with the federal government. For the very large amount of power that you must of necessity use for the electrochemical works planned the best nearby sites are on the Deschutes River. We have had a careful examination made of all these powers, and have also looked up the titles, but our own men report that at every one of the practical sites any commercially feasible development will involve flooding or otherwise using more or less government land. Practically all of this land is of little value except for water-power purposes and has been withdrawn by the government.

"As the result of the interpretation of the present laws and of the change in ideas of successive department officials in Washington, a large number of permits have been revoked, and there are to-day numerous suits pending in the federal courts wherein the government is seeking to eject from the land the people who have already spent millions of dollars for the building of public service plants under these revocable permits.

"Our counsel has also brought to our attention the fact that under the present laws of the State of Oregon it is impossible to get more than a forty-year tenure, and that any one who spends his money on water-powers under the present laws must take his chances on having the water summarily taken away from him at the end of the forty-year period, or in the alternative take a renewal permit under whatever conditions the State may at the end of the forty years dictate.

"The builder who puts $10,000,000 or $15,000,000 into a plant of this kind is helpless because concrete dams can't be moved away and sold, and the builder will necessarily be forced to throw himself on the mercy of the State at that time.

"Under these circumstances we see no way of raising the money to enable us to furnish you with a very large amount of power at low rates for development of this industry near the mouth of the Deschutes River. One of our companies has a small water-power property, and if you can use so small an amount as 5000 hp. we shall be very glad to arrange for immediate development and delivery of this power to you at any place you would like to have it in the neighborhood of your proposed location.

"I may say, in passing, that the laws of the State of Washington do not contain the objectional forty-year tenure provision now in the Oregon law, and if any suitable power sites can be found on the Washington side of the Columbia, where no government land is involved, there should be no difficulty in raising the necessary capital for their development. If the laws can be so changed that capital can be safely invested on the Deschutes River for the development you require, I shall be glad if you will again bring the matter to our attention, as the development of 100,000 hp. or more, which you think will be ultimately required, will interest us very much."

War's Effect on Stock Averages

Although the United States is neutral, one year of European war was sufficient to cause the securities of her great industries to go through the various stages of a panic. This is well shown in an average of the prices of a number of stocks of electric manufacturing companies and of lighting companies.

TABLE OF AVERAGES

	Week Ended			
	(1) July 24, 1914	(2) July 30, 1914	(3) Dec. 18, 1914	(4) July 30, 1915
Common stock of three large electrical manufacturers ...	77.5	70.08	71.92	101
Common stock of twelve electric-lighting companies.....	81.5	73.39	77.46	78.38
Preferred stock of eight electric-lighting companies.....	74.78	71.94	70.28	69.88

Each of the manufacturing companies represented in the above table is now working on war orders. The lighting utilities are mostly holding companies. They represent a wide geographical distribution. The dates chosen in the table show (1) conditions prior to the declaration of war, (2) conditions on the day of closing of the New York Stock Exchange because of the general financial demoralization, (3) conditions on the opening of the exchange, and (4) conditions one year after the declaration of war and the closing of the New York Stock Exchange.

The aggregate par value of the capital stock, both common and preferred, of the three manufacturing companies here represented amounts to approximately $185,000,000, or considerably over half of the total capital stock of the electrical manufacturing industry of the United States. The twelve companies of which the common stock averages are quoted have an aggregate capital stock of more than $290,000,000, which is roughly 25 per cent of the outstanding stock of the electric-lighting utilities of the country. The total par value of the capital stock of the eight companies of which the preferred stock averages are quoted amounts to somewhat more than $130,000,000, or roughly 10 per cent of the total for the nation.

In the average prices of stocks of the lighting utilities the change during the past six months has been less than one point. Although the common stock fell off considerably at the declaration of war, it was quick to recover. In the period between the last few days of July, 1914, and the opening of the New York Stock Exchange in December, the stocks of the electric-lighting utilities which had been thrown on the American market were absorbed and with such rapidity that the market for these securities was again approximately normal.

Convention of Edison Sales Managers

The fifth annual convention of sales managers of some of the larger companies connected with the Association of Edison Illuminating Companies was held on Aug. 2 to 4 at Passaconaway Inn, York Cliffs, Me. An attendance of about thirty was registered in advance, including representatives from the following companies: United Electric Light & Power Company of New York, New York Edison Company, Edison Electric Illuminating Company of Brooklyn, Edison Electric Illuminating Company of Boston, Philadelphia Electric Company, Detroit Edison Company, Consolidated Gas, Electric Light & Power Company of Baltimore, Potomac Electric Power Company of Washington, Cleveland Electric Illuminating Company, Commonwealth Edison Company of Chicago, Public Service Electric Company of Newark, and Union Light & Power Company of St. Louis.

A formal program of papers and discussion was arranged for the various sessions, which were executive The subjects included substantially all of those in which salesmen are interested, covering the larger contracts for energy, uses of showrooms, appliances, etc. Mr. A. A. Pope, New York Edison Company, was the chairman of the convention.

"Electrical Prosperity Week" Campaign

The Society for Electrical Development will issue soon a series of booklets addressed to the different interests in the industry, advising them how they can handle some of the phases of the "Electrical Prosperity Week" movement for their material benefit.

Many pledges of support in the campaign are being received by the society. The Electrical Supply Jobbers' Association passed the following resolution at a recent convention:

"Whereas, the great electrical industries of America, represented by the central stations, the manufacturers, the jobbers, the contractors, and the trade publications, have decreed a nation-wide publicity movement, aiming to stimulate business generally and to encourage and popularize the use of electricity and electrical appliances, which will culminate in 'Electrical Prosperity Week,' Nov. 29 to Dec. 4, 1915; and

"Whereas, this remarkable trade campaign is to be managed by the Society for Electrical Development, which has among its members leading representatives of all branches of the electrical industry, and further has engaged the services of a staff of campaign experts to conduct the movement so that every city and town in America will bask in the brilliancy of united electrical effort; therefore be it

"Resolved, that we, the Electrical Supply Jobbers' Association, recognizing that the policies and plans of the Society for Electrical Development are drawn along the broadest lines looking to the commercial co-operation of all branches of the business in the extension and cultivation of the electrical market, do hereby indorse and approve the trade movement centralized in 'Electrical Prosperity Week' and pledge to the Society for Electrical Development, whether individually members of the society or not, our whole-hearted support and co-operation, and, further, that it is the sense of this convention that all jobbers should join with representatives on the directorate of the Society for Electrical Development to the end that 'Electrical Prosperity Week' shall achieve that reawakening of electrical business conditions and that courage and confidence in America, its institutions and its business which are essential to the healthy maintenance of the commercial prestige of the nation."

Validity of Marconi Patents Questioned

A suit has been brought by Mr. Nikola Tesla against the Marconi Wireless Telegraph Company of America seeking the annulment of one of the chief Marconi patents. Simultaneously with the suit for the annulment, Mr. Tesla has also brought a suit against the Marconi company for infringement of his patents. In the present suit Mr. Tesla bases his action on the allegation that two patents (Nos. 645,576 and 649,621) were granted him in 1900 and that the Marconi patent (No. 763,772) was not granted until 1904.

The answer of the Marconi company denies that the Marconi patent covers the inventions or combination of apparatus described by the Tesla patents, and also denies that the company is guilty of any infringement.

Speaking on the alleged infringement of his patents, Mr. Tesla said:

"My patents describe a new and original wireless system characterized by the employment of four circuits in perfect resonance, a condition essential to successful practice. Long after their grant to me Marconi filed an application and secured a patent which covers exactly the same fundamental arrangement. In a recent suit in France involving the same or corresponding patents the highest court, acting on a statement submitted by me, decided against Marconi and recognized my priority of invention in all the important features."

In a statement issued the general manager of the Marconi company contended that Marconi has a right to his patent and can establish that right in the court.

Electrical Exhibit Wanted in Buenos Aires School

Mr. J. A. Massel, special agent of the Department of Commerce, who returned recently from a trip of investigation into machinery markets in South America, is visiting the New York branch office of the Bureau of Foreign and Domestic Commerce to give advice to manufacturers. From New York he will go to Boston, Cleveland, Chicago, St. Louis, and possibly to San Francisco, and will then go to Washington before starting on a second trip to South America in September.

In connection with his more specific investigations of openings for American machinery, Mr. Massel incidentally looked into various matters of electrical interest. In Buenos Aires, Argentina, he learned from Mr. Eduardo Latzina, director of the National Industrial School, that exhibits for the Technological Museum connected with the school are desired from American manufacturers. This school has between 500 and 600 students. The exhibits might take the form of actual machines or models of machines, or civil engineering works, tools, construction materials of all kinds, etc. The exhibits would be donated and the school directorate would arrange to have them admitted to the country free of duty and would provide for their installation in the museum. Mr. Latzina suggested that it would be an advantage to send models of machinery fitted with electric motors for 220-volt operation, direct current, in order that they might be exhibited in actual operation. For the electrical section of the school are wanted:

Samples of cables for all classes of electrical currents; samples of materials employed in electrical installations; electric lamps of all kinds; instruments for measuring electrical energy; tools for electricians; accumulators; electric batteries; electric-lighting appliances; alternating-current and direct-current generators and motors; electric-railway motors; special generators for lighting railway cars; telephones; telegraphic apparatus; special instruments for medical purposes. One of the other classes of exhibits desired is models of special appliances for interior housecleaning.

Miscellaneous News Notes

Customers Number 835 in Town of 4500.—With a population of 4500, the little city of Wilmington, Ohio, now has 835 lighting customers, who are served by the Dayton Power & Light Company, which supplies central-station service in Wilmington. Early in July an electric-heating-device campaign was carried out at Wilmington with the aid of one of the large manufacturers, and the sales during this week included twenty-nine electric irons, ten toaster stoves and one sewing-machine motor.

United States Produced Two-thirds of World's Petroleum in 1914.—The quantity of petroleum entering the markets of the world in 1914 amounted to 400,483,489 barrels, according to statistics compiled under supervision of Mr. J. D. Northrop of the United States Geological Survey. Of this record-breaking output the United States is credited with 66.36 per cent, its production totaling 266,000,000 barrels, while Russia came second with 67,000,000 barrels and Mexico third with 21,000,000 barrels.

Kansas City Electric Shop Sold 5000 Irons in July.—The Electric Shop of the Kansas City Electric Light Company ordered a carload of electric irons for its July special sale, but Miss Russell, the manager, was forced by exigencies of floor space to receive the irons in small shipments, and when the month closed the last lot of 1000 had not yet arrived. But the 4000 already received had been sold and delivered, and there were orders on hand for the additional thousand. During August the shop will sell electric fans at a discount of about 15 per cent.

Electric Minnows for Night Fishing.—An observant inventor, who noticed that the stomachs of such game fish as bass and muskellunge often contain glow-worms and other phosphorescent insects, has devised a novel electric-lighted bait for deep-water trolling and night fishing. This is in the form of an artificial minnow, made of celluloid and containing a miniature electric lamp supplied with energy over fine copper wires carried along the fish line. A contact button permits the lamp to be flashed intermittently like a glow-worm's light, in order to attract the fish.

Controversy Over Post Office Contract in Pasadena, Cal.—A controversy has arisen between the Southern California Edison Company and the municipal lighting department of Pasadena over the contract for energy for the new post office in Pasadena. General Manager Koiner of the municipal department says that in submitting a bid he offered the same schedule of rates that applies throughout the city of Pasadena. He charges that the Southern California Edison Company offered energy for both light and motor service at 2½ cents per kw.-hr. This rate, Mr. Koiner says, is not in accord with the schedule filed by the company with the Railroad Commission.

Electrified Farming in Lancaster County, Pa.—Already 125 farmers in Lancaster County, Pa., are taking electric service from the lines of the central-station companies which cross the county, and of this number thirty have installed motors. So many inquiries have been received from farm owners in the section that one of the Lancaster electric companies is considering the installation of a special department to look after farm business. Mr. D. L. Markle, instructor in electrical engineering at the Pennsylvania State College, has just completed a bulletin on "Electric Light and Power for Country Homes," which sets forth much information of interest to farmers concerning electric lighting of farmhouses, outbuildings and barns, and the uses of electric motors on the farm and in agriculture.

Doherty Company Offers $3,500 in Prizes for Ideas.—In order to benefit by the originality and knowledge of employees of all grades, Henry L. Doherty & Company, New York, have announced a plan to distribute nearly $3,500 in prizes for competitive papers within the next six months. Thirty-two subjects for papers have been selected, embracing electrical, street-railway, accounting, new-business and bond topics. One subject a month will be announced for each department, and thirty days will be given for the preparation of each paper. For each of the thirty-two subjects decided upon by the committee, prizes will be offered as follows: First, $40; second, $20; third, $10, and $2 each for that half of the remaining contestants who are rated by the judges as having written the best papers.

The Telephone Probe in War Surgery.—For locating bullets, pieces of shrapnel and other metallic foreign particles embedded deeply in the flesh of wounded men army surgeons now make use of the "telephone probe," which aids greatly in the rapid detection of such foreign bodies. According to the London *Lancet* the telephone probe as generally used consists only of a sensitive telephone receiver connected in series with a small battery. One terminal of the set is brought into contact with the moistened skin of the patient, while the other is connected to the surgeon's metal probe. While the latter is being moved through the fleshy part, no sound is heard in the receiver, but at the instant the probe clicks into contact with the metallic foreign body a distinct sound is heard in the earpiece, caused by the increased current flow due to the larger conducting area offered by the bullet or other body. If an insulated probe is used the method becomes even more sensitive. Any good electrically conducting body, even if extremely small, is readily detected, and other solid material such as bone gives rise to no sounds whatever. Bullets, shrapnel and other pieces of metal can thus be located where the simple probe fails to give any tactile sensation, or when the tactile sensation of bone may lead the operator astray.

Associations and Societies

Cincinnati Section Outing Attended by 1000.—The annual outing of the Union Gas & Electric Company Section of the National Electric Light Association held at Cincinnati, July 24, was attended by more than 1000 persons. A number of prizes donated by local electrical and manufacturing companies were presented to the winners in the athletic contests. Mr. J. M. Cronin headed the outing committee.

The Dixie Club of Electrical Jobbers.—Mr. Oscar Turner of Birmingham, Ala., is president and Mr. T. A. Burke of Atlanta, Ga., is secretary of the Dixie Club, an organization composed of about twenty jobbers of electrical supplies in central Southern cities. The club meets about once every three months to discuss matters of mutual interest. The membership includes jobbers in Memphis, Atlanta, Birmingham, Chattanooga, St. Louis, Louisville and Evansville.

Utah Power Company's Employees' Bulletin.—The Utah Power & Light Company's new *Bulletin*, which will be issued by the company every month and distributed free to its employees, has made its initial bow with the July number. A large proportion of the thirty-two pages of this issue are devoted to commercial topics and to an account of the reorganization of the company's staff. Mr. W. R. Putnam is editor in chief and Mr. L. S. Gillham is associate editor.

Dallas Electric Club Holds Power Sales Contest.—A feature of the weekly luncheon talks of the Dallas (Tex.) Electric Club on July 30 was the sales competition between Messrs. C. F. Warner, a motor-service sales engineer of the Dallas Electric Light & Power Company, and Mr. Benjamin Howard, a sales engineer of the Texas Power & Light Company, both of Dallas. The contestants presented arguments to induce a large energy consumer to use central-station service, and a prize was given to that salesman who, in the judges' opinion, conducted the best line of attack.

"Loop" Parking System for Chicago Users of Electric Vehicles.—That the electric vehicle requires no chauffeur for its operation has long been conceded to be one of its chief advantages. However, women who run their own cars have realized some difficulty in using them for shopping purposes in Chicago's "loop." Appreciating this difficulty, several garages have established a down-town parking service for their customers, enabling cars to be left at the Electric Shop of the Commonwealth Edison Company, where licensed chauffeurs drive them over to Grant Park and return them again on call or when ordered. There is no charge for this service. All electric garages represented in the Chicago Section of the Electric Vehicle Association are participants in the plan, and shortly a notice will be sent to every user of an electric vehicle in Chicago and vicinity telling about the service. In the fall a night service will be arranged for theater patrons.

American Electrochemical Society at San Francisco.—The annual meeting of the American Electrochemical Society will be held at San Francisco, Cal., Sept. 16 to 18, Both the American Institute of Electrical Engineers and the American Institute of Mining Engineers will be in session during this week, and joint meetings with these societies have been arranged for Friday, Sept. 17. The meetings of the International Engineering Congress will be held the following week. Among the papers of electrical interest to be presented at the sessions of the American Electrochemical Society are the following: "Electrochemical Synthesis of Phenol Hydroxylamine," by Mr. D. M. Frederiksen; "Electrolytic Antimony Refining," by Mr. A. G. Betts; "Electrodeposition of Nickel," by Messrs. C. W. Bennett, Rose and Tinkler; "Electromotive Forces," by Mr. W. D. Bancroft; "Heat Losses from an Electric Steel Furnace," by Messrs. Wills and Schuyler; "Use of the Flame Arc in Paint and Dye Testing," by Mr. W. R. Mott; "Electric Steel Costs," by Mr. F. T. Snyder. At the joint session with the mining engineers, scheduled for Friday morning, Mr. R. S. Wile will present a paper on "Melting of Ferroalloys in the Electric Furnace"; Mr. Laurence Addicks one on "Electrolysis of Copper Sulphate Liquors Using Carbon Anodes," and Mr. F. R. Pyne one on "Solution Stratification as an Aid to the Purification of Electrolytes." At the joint meeting with the American Institute of Electrical Engineers, held on Friday afternoon, Mr. F. M. Sebast will speak on "Electrical Resistance of Copper-Nickel-Chromium Alloys," and Mr. J. W. Beckman on "Electrochemical Possibilities on the Pacific Coast." Special transportation facilities have been arranged by a convention committee, of which Mr. J. M. Muir, 239 West Thirty-ninth Street, New York City, is chairman. The society's special train will leave New York Saturday, Sept. 11, and the special engineers' train will leave New York Thursday, Sept. 9.

Public Service Commission News

New Jersey Commission

The board has dismissed a complaint of the Bell Electric Motor Company, Garwood, against the Public Service Electric Company. The latter company notified the Bell company that the use of electrical energy from a motor-generator set for lighting purposes must be discontinued unless arrangements were made to pay for such energy as was used by the motor at the regular lighting rate. The board upholds the Public Service Company, and declares that to render the Bell company illuminating service at motor-service rates would be discrimination. The board holds that the charge for service for an electric sign and for ordinary factory illumination, whether furnished directly or through a motor-generator set, should accord with the regular lighting schedule.

Pennsylvania Commission

Arguments were heard by the commission at Harrisburg on July 27 and 28 on the tentative telephone rates fixed by the commission. Mr. James C. Jones, representing the Keystone Telephone Company of Philadelphia, argued that the commission can interfere only to correct a wrong rate established by public utility companies. Commissioner Pennypacker held that the commission had power to prevent a rate from being put into effect and to order it to be changed. The companies contended that the only way in which it is possible to determine a fair rate is to make a separate investigation of each company in every locality.

Mr. R. V. Mayre of New York, general counsel for the Bell Telephone Company of Pennsylvania, said that that company was willing to waive the question of the jurisdiction of the commission in rate-making, but that the value of all Bell property in the State should be considered. The Bell company interests, he said, are so interdependent that locality conditions of any character are not the important factors in rate determination.

Mr. H. Finley French, who represented the Chamber of Commerce of Pittsburgh, opposed this method and asked the commission not to make a decision until it had studied conditions thoroughly in at least one community.

New York Commissions

A conference to consider modifications in the form of annual reports required from gas and electric corporations by the New York Public Service Commission, Second District, and the New York State Tax Commission, held at Albany on Aug. 3, was attended by representatives of both of those commissions and by members of the executive committee of the Empire State Gas & Electric Association. Commissioner Carr of the Public Service Commission presided. The following were present: Mr. Hasbrouck and Mr. Taafe of the Public Service Commisison; Deputy Tax Commissioner Witmer, Messrs. J. C. DeLong, J. T. Hutchings, H. W. Peck, C. H. Graf, C. G. M. Thomas, E. C. Scobell, J. M. Brucker, P. A. Burns and Charles H. B. Chapin. It was decided to appoint a committee of three, consisting of representatives of the Public Service Commission, the Tax Commission and the Empire State Gas & Electric Association, to consider the modifications to be carried out.

Oregon Commission

In the case brought before the Oregon commission by the city of Bend, Ore., against the Bend Water, Light & Power Company for the reduction of the utility company's rates for electricity and water, the question at issue involved the valuation of the property of the defendant company. In addition to the testimony given by the company's officials concerning its business, income, expenses, etc., an original investigation was conducted into the affairs of the defendant by the commission's experts, who submitted separate reports covering the reproduction cost new, accrued and annual depreciation, and reproduction cost less depreciation of the defendant's property.

To reproduce new the electric plant as a going concern, including material, supplies and working capital on hand, would have required on Dec. 31, 1914, the expenditure of approximately $94,282, according to the commission's experts. Because of age and use the property has depreciated below such standard of normal new and usable condition (taking salvage value into account) by $10,144, leaving the reproduction cost of the plant $84,118. In addition to the electric plant proper, the company owns other electrical equipment and land valued at $47,500.

The income of the electric plant for the fiscal year ended June 30, 1914, amounted to $12,275. This amount when lessened by a fair depreciation annuity leaves an operating income of $9,775, available for return on the investment—which is equal to 11 per cent on the commission's estimate of the value of the property so devoted. The commission asserts that the rates for electricity supply in Bend are higher than similar rates in towns and cities of like population, and that the rate of return yielded is greater than the rate of return ordinarily expected and received on investments generally and in the class of utility service in which the defendant is engaged in Bend. The commission therefore ordered put into effect the following schedule of rates for electric service.

Flat-rate lighting: For first 40 watts installed, 1.25 cent per watt per month; for next 60 watts installed, 1 cent per watt per month; all over 100 watts installed, 0.8 cent per watt per month. Minimum monthly charge, $1, subject to discount for prompt payment.

Meter rate for lighting—residence and business schedule: First 15 kw.-hr. in any month, 12 cents per kw.-hr.; next 15 kw.-hr., 10 cents per kw.-hr.; next 170 kw.-hr., 6.5 cents per kw.-hr.; all over 200 kw.-hr., 5.5 cents per kw.-hr.

Rates are defined for the twenty-four-hour motor-service schedule, begininng at 7 cents per kw.-hr. and extending down to 2 cents per kw-hr. for energy used in excess of 2000 kw.-hr. An optional rate is also offered the customer in a demand charge of $1 per horsepower of "active load" per month, plus 4 cents per kw.-hr. per month for the first 500 kw.-hr. used during the month, and so on.

Where water heaters are used in connection with electric ranges, and the customer has his premises so wired with a double-throw switch that the demand of his water heater (which must not be greater than that of the range) cannot be coincident with the cooking demand, a flat-rate charge of 50 cents per month is made for the first 100 watts, and 30 cents per 100 watts for all over the initial 100-watt connected load.

Personal

Mr. W. R. Pinckard, president of the Electric Club-Jovian League of Chicago, is spending three months at Watrous, N. M., where Mrs. Pinckard is undergoing a course of treatment at the Valmora Sanitarium.

Mr. C. C. Curtis, formerly of Houghton, Mich., has been appointed lighting superintendent of the El Paso (Tex.) Electric Railway Company. He succeeds Mr. L. W. Pritchett, who will go to California for the benefit of his health.

Mr. W. R. Eidson has been elected president of the Alamogordo (N. M.) Electric Light & Power Company, succeeding Mr. I. H. Kempner of Galveston, Tex. Mr. Z. D. Ross has been elected secretary-treasurer of the company, succeeding Mr. Guy I. Watt.

Col. D. R. Street, the president of the Canadian Electrical Association and secretary-treasurer of the Ottawa Electric Company, has been given command of the Seventy-seventh Canadian Regiment of Ottawa. It is reported that Colonel Street will leave shortly for the European battle front.

Mr. E. S. Gillette has been appointed electrical engineer of the Aurora, Elgin & Chicago Railroad, succeeding Mr. E. F. Gould, who has resigned to take up consulting work at Cleveland, Ohio. Mr. Gillette was formerly assistant engineer, and in his new position will have charge of the power plant, lines, substations and shop department.

Mr. Guy E. Tripp, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company and former president of the West Penn Traction Company, Pittsburgh, Pa., which operates a number of electric railway and lighting properties in the vicinity of Connellsville, Pa., has been elected chairman of the board of directors of the West Penn company.

Mr. Paul M. Lincoln, who retired Aug. 1 as president of the American Institute of Electrical Engineers, first entered the electrical field with the old Brush Electric Company of Cleveland, Ohio, in January, 1892, and from the close of that year until the present has, with the exception of several years spent at Niagara Falls, been almost continuously connected with the Westinghouse Electric & Manufacturing Company, for which company he is now general engineer. Mr. Lincoln was born Jan. 1, 1870, and was graduated from the Ohio State University at Columbus in 1892, receiving the degree of electrical engineer. After spending twelve months with the Brush company, young Lincoln joined the staff of the Westinghouse company at Pittsburgh in December, 1892. In March, 1895, he entered the employ of the Niagara Falls Power Company, Niagara Falls, N. Y., where he remained for seven years, returning, in May, 1902, to the Westinghouse company at Pittsburgh. Since 1911 Mr. Lincoln has also served as professor of electrical engineering in the University of Pittsburgh. He was a member of the board of managers of the Institute from 1906 to 1909 and was vice-president from 1909 to 1911. For his work in the invention of the synchronism indicator Mr. Lincoln received the John Scott Medal of the Franklin Institute of Philadelphia. He is a Fellow of the A. I. E. E., a charter member of the American Electrochemical Society, and a member of the American Society of Mechanical Engineers, the Engineers' Society of Western Pennsylvania, the Society for the Promotion of Engineering Education, the Franklin Institute of Philadelphia, the Jovian Order, and the Engineers' Club of New York City.

P. M. LINCOLN

Mr. Milo R. Maltbie, formerly member of the Public Service Commission, First District, for the State of New York, and recently chairman of the valuation committee of the National Association of Railway Commissioners, has been appointed a member of the advisory board to Mr. C. A. Prouty, director of the valuation division of the Interstate Commerce Commission, Washington, D. C.

Dr. Walter Nernst, inventor of the Nernst incandescent lamp and director of the Physico-Chemical Institute of the University of Berlin, has been awarded the Iron Cross of the First Class for distinguished services of a scientific character for the German army. Professor Nernst is now fifty-one years of age, having been born at Briesen, West Prussia, in 1864. His scientific training was received at schools in Zurich, Berlin, Graz and Wurzburg. Dr. Nernst has contributed to the technical press many papers on scientific, physical and electrochemical topics, based upon his original researches on the resistance of materials at various temperatures, the conductivity of electrolytes, the melting and boiling points of liquids, and on the Welsbach incandescent mantle.

Mr. H. S. Cooper of Dallas, Tex., formerly general manager of the Galveston (Tex.) Electric Company and for the last three years executive secretary of the Southwestern Electric & Gas Association, the largest sectional organization of utility operators in the United States, has entered the field of consulting engineering for the construction, operation and management of electric-lighting, electric-railway and waterworks plants. Mr. Cooper will have his office at 405 Slaughter Building, Dallas, and will continue his connection with the association as its secretary. Born in 1856, Mr. Cooper at the age of twenty began the manufacture of agricultural equipment in the South, and shortly afterward entered the electrical field, being appointed manager of the Schenectady (N. Y.) properties of the Electric Development Company in 1893. After placing these electric-lighting, gas and railway utilities on a paying basis, Mr. Cooper directed the rehabilitation of the Ithaca (N. Y.) Railway. Later he joined the staff of the Development Company of New York City, preparing critical reports on electrical propositions for clients. In July, 1904, he accepted the position of general manager of the Galveston City Railway, and, during a busy period of reorganization and reconstruction, continued until 1910 with that company and its successor, the Galveston Electric Company. About this time he was retained to supervise the design and construction of the new Hotel Galvez at Galveston, and tendered his resignation to the Stone & Webster interests as manager of the Galveston electric railway and lighting properties. During his service as executive secretary of the Southwestern association, Mr. Cooper's advice and help on engineering and management problems have been sought by many members of the association, and his office has been headquarters for the collection and compilation of operating data of much value to the utility companies of the State.

H. S. COOPER

Mr. Samuel Insull, president of the Commonwealth Edison Company of Chicago, has been elected president of the West Penn Traction Company, which operates electric-railway and electric-lighting properties throughout a large region surrounding Connellsville, Pa. The headquarters of the company are at Pittsburgh, and the operating office is at Connellsville. Among the companies controlled by the West Penn Traction Company are the West Penn Electric Company, the West Penn Lighting Company, the West Penn Light & Power Company, the Kitanning Electric Light Company, the Interborough Electric Company, the Butler Light, Heat & Motor Company, the Allegheny Valley Light Company, the Pittsburgh & Allegheny Valley Traction Company, the Kitanning & Leechburg Railways Company, the Latrobe Street Railway Company, the Wheeling Traction Company, and the Pittsburgh, McKeesport & Greensburg Railway Company. Mr. Insull succeeds as president Mr.

Guy E. Tripp, who has been elected chairman of the board of directors.

Mr. Robert S. Orr, who was elected fourth vice-president of the National Electric Light Association at the time of its convention at San Francisco in June, is the general manager of the Duquesne Light Company, Pittsburgh, Pa. Mr. Orr is a native of Clarion County, Pa., and is a graduate of Washington and Jefferson University. For two years after his graduation he taught in the Washington and Jefferson Academy, finally leaving that institution to become principal of the Allegheny (Pa.) public schools. In 1904, however, Mr. Orr forsook teaching as a profession in order to become general contracting agent of the Allegheny County Light Company, the predecessor of the Duquesne Light Company. Shortly afterward he was made acting superintendent, and less than a year afterward he was promoted to the post of general superintendent. He is also the inventor of a method of reinforcing decayed wooden poles with concrete which is used extensively throughout the United States by telephone, railway and lighting companies. Mr. Orr has been a member of the executive committee of the N. E. L. A. for several years past, and is a past-president of the Pennsylvania Electric Association. He is a member of the Engineers' Society of Western Pennsylvania, the American Electrochemical Society, and the American Institute of Electrical Engineers.

R. S. ORR

Obituary

George S. Hannaford, secretary of the Phelps Manufacturing Company of Chicago, and his wife were killed on July 16 when their automobile was turned over near Diamond Lake, Mich. Mr. and Mrs. Hannaford were on a vacation trip through Michigan at the time of the accident.

Hubert Sauer, director of the municipal electric-lighting plant of Vienna, Austria, died in that city July 8. The funeral services, held on the following Sunday, were marked by the attendance of a large number of distinguished members of the electrical-engineering profession of Austria, who gathered to pay tribute to Herr Sauer, whose untimely death is mourned by the electrical profession of his nation.

Henry Alexander Mavor, a pioneer in electric-lighting and electrical manufacturing in England, one of the founders of the British firm of Mavor & Coulson (Ltd.), and who was recently called into consultation on the design of the electrical propulsion machinery for the United States collier Jupiter, died at Mauchline, Ayrshire, England, July 16. Mr. Mavor entered the electric-lighting field in 1879, working under the direction of Mr. R. E. Crompton, and afterward installed the first electrical plant in Glasgow, Scotland, from which the present municipal system has grown. With prophetic vision, Mr. Mavor early proposed for the Scotch city a central power plant with high-tension transmission to substations. This scheme was at the time discarded in favor of a local power station, but with the advance of the art the latter plant has itself now been abandoned and Mr. Mavor's original scheme has been actually followed out. After the purchase of his Glasgow plant by the municipality, Mr. Mavor turned his attention to the manufacture of electrical apparatus. In recent years he secured many patents on his inventions relating to the electric propulsion of ships, and carried out experiments with a 2000-ton vessel which gained him wide recognition from naval architects and engineers. He visited the United States twice in connection with the design and construction of the collier Jupiter.

Corporate and Financial

Alabama Traction, Light & Power Company, Ltd., Montreal, Canada.—In the annual report for the year ended Dec. 31, 1914, President James Mitchell says in part: "The consolidated income and operating statement for the year does not convey a proper idea of the company's present position. It was nearly the end of the year before some of the larger motor users were being supplied regularly from the hydroelectric plant and the operation of the Gadsden steam plant discontinued. Consequently, the year closed with the rate of earnings far in excess of the average that might naturally be deduced from the consolidated income and operating statement. The stocks of the United Gas & Electric Company, of which the company owns 20,000 shares, have suffered a heavy depreciation in common with public utility shares in general. A return of prosperity throughout the districts served by the United Gas & Electric Company should restore the former values, and it is not the intention of the board to sell these shares at the present time. The war in Europe has resulted in a general business depression far more severe than any which had existed previously. As a direct consequence, it has been impossible to secure new motor-service business on the scale anticipated, and at the close of the year revenue was very considerably short of the amount necessary to cover fixed charges and operating expenses. At the outbreak of the war tentative arrangements which had been made in London for further financial requirements unfortunately could not be consummated. The company consequently found itself without funds to meet bond interest due in September, 1914, to complete necessary construction work to serve its prospective customers and to liquidate obligations to manufacturers and other creditors, while the state of the market precluded the possibility of marketing further securities of the type already authorized. It was necessary to convoke a meeting of bondholders, at which they agreed, first, to defer for three years respectively the bond interest due on Sept. 1, 1914, and March 1, 1915; second, to cancel the obligations to provide a sinking fund for repayment of the bonds, and, third, to authorize the subsidiary companies to issue prior-lien bonds or debentures. The outlook for considerable additional new business in the near future is decidedly favorable, and negotiations are now being conducted with several important motor users with excellent prospects of success. "Primary power" is used to apply to that class of energy which the company is under obligation to supply at all times, using its steam plants if necessary to supply any deficiency of river flow during the dry season. "Secondary power" is that class which the company agrees to supply only for a certain average number of months, usually nine to ten, per year, during which an ample supply of water in the river is anticipated. A summary of power contracts obtained follows:

	No. of Consumers	Kilowatt Demand	Estimated Gross Annual Revenue
Prior to 1914	10	5,983	$231,100
During 1914	16	22,567	490,130
Jan. 1 to June 1, 1915	9	4,785	81,450
Total	35	33,335	$802,680

The consolidated income and operating account for the year, eliminating inter-company items, follows:

Operating revenue:		
Light and power department		$513,233
Railway department		94,463
Gas department		45,358
Water department		4,539
Total		$657,593
Deduct:		
Rebates and discounts	$35,137	
Reserve for bad debts	2,678	
		37,815
Net operating revenue		$619,778
Deduct operating expenses:		
Light and power department	$217,577	
Railway department	71,841	
Gas department	27,665	
Water department	5,209	
General expense	1,000	
		323,292
Net operating income		$296,486
Add interest on deposits		3,070
Gross income before deducting bond interest and depreciation		$299,556

Boise-Payette River Power Company.—Notices have appeared calling to the attention of holders of the first mortgage 6 per cent bonds due in 1921 that a default in the conditions of the trust deed securing these bonds has been created which seems to eliminate the sinking fund provided for the redemption of the bonds. Bondholders are urged to form a protective committee.

Brazilian Traction, Light & Power Company, Ltd., Montreal, Canada.—The company has reduced the quarterly dividend payable on Sept. 1 to one-half of 1 per cent. This action was taken by the directors because of the abnormally high rate of money exchange, although the earnings this year are ahead of those of last year.

Cincinnati (Ohio), Newport & Covington Light & Traction Company.—At a meeting of stockholders on July 28 the directors were authorized to proceed with an agreement to a plan for refunding the bonded indebtedness of the Union Light, Heat & Power Company that was proposed by the Columbia Gas & Electric Company, which leases the property from the traction company. It is proposed to issue $5,000,000 of fifty-year bonds to take up the present issue of $2,000,000, which matures in 1918, and to pay for improvements and betterments. The Columbia Gas & Electric Company will provide a sinking fund for the redemption of the bonds at maturity.

Kansas City (Mo.) Railway & Light Company.—Judge Hook of the United States District Court completed in Chicago this week hearings of the plans for reorganization. The plan in outline provides for an indebtedness allowance of $28,700,000 for all the present companies, which is to be borne by two new companies, one representing the railways and the other the lighting interests. The indebtedness includes some underlying liens and some collateral liens of the holding company. The court decided that approximately $5,000,000 of the indebtedness thus allowed should be borne by the new light company, to be divided about three-fifths in first mortgage bonds and about two-fifths in second mortgage bonds. It was further provided that the railway company should issue approximately $8,000,000 of 5½ per cent three-year notes, an open first mortgage, of which $10,000,000 first mortgage 5 per cent bonds, for purposes of the plan, shall be issued, and $5,700,000 second mortgage bonds. It was provided that the holders of the present securities accept the new securities at par and maintain as far as possible the existing liens. Of the open mortgage, in addition to the bonds used in carrying out the plan, further amounts of bonds may be issued at the discretion of the court prior to existing liens, such as receivership obligations, expenses incurred thereby, personal injury judgments, etc. In addition there will be issued $1,000,000 bonds for immediate capital expenditure on the railway and another $1,000,000 for the light company. All of the bonds will mature in 1944, but a sinking fund has been provided in the case of the second mortgage, which will retire all of that issue before maturity. The plan provides for a board of readjustment managers, composed of Kuhn, Loeb & Company, Blair & Company, Lee, Higginson & Company, and Mr. H. L. Stewart of N. W. Halsey & Company, the latter acting in an individual capacity.

Leipsic (Ohio) Electric Light Company.—The approval of the Ohio Public Utilities Commission has been asked for the sale of control of the company to the Northwestern Ohio Light Company for $46,000.

Minnesota Valley Power Company, Montevideo, Minn.—An issue of $115,000 first mortgage sinking-fund 6 per cent gold bonds due on Feb. 1, 1935, is offered at par and interest.

Mount Whitney Power & Electric Company, Visalia, Cal.—Under authority of the Railroad Commission of California, the company may issue $440,000 first mortgage 6 per cent sinking-fund gold bonds at not less than 95. Pending the sale it may pledge the bonds at not less than par as collateral for notes to be given to the Tulare County Power Company as part of the purchase price of that property. The Mount Whitney company purchased for $550,000 the property of the Tulare company and states that the balance of the purchase price will be met from current assets and earnings.

Pacific Gas & Electric Company, San Francisco, Cal.—The company has been authorized by the Railroad Commission of California to acquire for $30,000 the stock of the West Sacramento Electric Company. The entire amount is to be reinvested by the sellers in preferred stock of the purchasing company at $82.50 a share.

Southern Iowa Railway & Light Company, Albia, Ia.—Mr. Alfred C. Mueller, Mayor of Davenport, has been appointed receiver of the company, which is a consolidation of the Albia Interurban Railway Company and the Albia Gas Company. Default was made in the payment of interest and of matured bonds.

Tulare County Power Company, Lindsay, Cal.—This company, the sale of which to the Mount Whitney Power Company was authorized recently, was organized in 1910 and on June 30, 1915, had 1053 consumers with a connected load of 4665 hp. It operated in Lindsay, Tulare and Exeter, Cal., but its principal revenue was derived from energy furnished for agricultural purposes. The company originally was a semi-mutual concern, energy being sold to stockholders at cost. The special stockholders' rate has been abolished, and all consumers are charged the same rates. The Mount Whitney company's lines parallel approximately 70 per cent of the Tulare company's lines.

Western States Gas & Electric Corporation, Stockton, Cal.—The California Railroad Commission has issued a supplemental order in the application for authority to issue $266,000 bonds and $33,000 notes, finding that the money is needed for plant, addition and betterments, and is not chargeable to operating expenses or income. The original order was issued June 30, 1914. The company estimates its necessary capital expenditures for the year ending May 1, 1916, at $257,000. The commission authorized the bonds to be sold at not less than 85 and the notes at not less than 93.

Manufacturing and Industrial

The Davis Slate & Manufacturing Company, Chicago, Ill., has appointed Mr. R. W. Ten Broeck manager of its branch office recently established at Detroit, Mich.

The Comet Storage Battery Company, 108 Fifth Avenue, Long Island City, N. Y., has been formed and is manufacturing various kinds of storage batteries. Mr. J. A. Hurst is president of the company, Mr. J. F. Warnecke is vice-president, and Mr. Hugo Kiel is secretary and treasurer. Mr. Hurst and Mr. Warnecke were formerly with the New York Telephone Company.

The Electric Cable Company, New York, has established an office in the People's Gas Building, Chicago, Ill., which will be in charge of Mr. James W. White, formerly with the Union Switch & Signal Company. Mr. J. M. Brown, formerly with the Lorain Steel Company, and Mr. C. R. King, formerly with the Pittsburgh Steel Products Company, have also been assigned to the Chicago office.

The American Spray Company.—The Spray Manufacturing Company, 201 Devonshire Street, Boston, Mass., which has recently been incorporated for the purpose of making spray-cooling systems, gas scrubbers, odor and fume condensers, etc., has changed its name to the American Spray Company. Mr. A. G. Eneas is president and chief engineer of the company, and Mr. C. H. Collyer is treasurer.

Fortieth Anniversary of Dickinson Manufacturing Company.—About 200 employees of the Dickinson Manufacturing Company, Springfield, Mass., manufacturer of molded insulation parts, attended the outing held at Springfield Turn Verein Park, Long Meadow, to celebrate the company's fortieth anniversary. Mayor Stacy of Springfield was present at the outing and gave a short address.

Exhibit of Central-Station Protective Devices.—The Metropolitan Engineering Company, 30 East Forty-second Street, New York, has prepared an exhibit of electrical protective devices which will be placed on display in the show windows of the American Museum of Safety, 14 West Twenty-fourth Street, New York, for two weeks. Following this display the apparatus will be removed to another part of the museum, where it will be held permanently on exhibit.

The McHugh Electric Company, 809 Morrow Street, Wilmington, Del., has recently been formed and is dealing in new and second-hand dynamos, motor field coils, armature coils, armature windings, etc. Mr. George McHugh is president of the company and Mr. Joseph H. MacLeary is secretary and treasurer.

Gold Medal for Cement Waterproofing Compounds.—The Standard Paint Company, Woolworth Building, New York, has been granted a gold medal (the highest award in its class) for "impervite," a cement waterproofing compound, by the jury of award at the Panama-Pacific International Exposition at San Francisco. The compound is an "asphaltic emulsion," and the manufacturer claims that a 0.75-in. facing of cement mortar containing the compound will make waterproof any leaky masonry.

Electric Grill for the New Equitable Building.—The National Electric Utilities Corporation, 355 West Thirty-sixth Street, New York City, has just installed an electric grill in the new Equitable Building, New York, for the Bankers' Club. The entire front of the grill has been finished with light-blue tile to conform with the general finish of the surrounding walls in the grill room of the club. The above manufacturer has also recently been awarded the contract for an electric-kitchen installation for the new Colony Club, at Sixty-third Street and Park Avenue, New York. Another order of note is one received from the St. Regis Hotel for electric hotel ranges. This hotel is already completely equipped with broilers, toasters and salamanders made by the National Electric Utilities Corporation.

Furnished Residence for Displaying Lighting Fixtures.—As noted in the ELECTRICAL WORLD of May 1, 1915, the H. W. Johns-Manville Company, Madison Avenue and Forty-first Street, New York, has made an arrangement, which went into effect May 1, to market the lighting equipment manufactured by the Mitchell-Vance Company. For the purpose of properly exhibiting these fixtures, together with those of its own development, an old brownstone mansion at 294 Madison Avenue, New York, which adjoins the H. W. Johns-Manville building, has been acquired, the idea being to show in appropriate surroundings various lighting fixtures for the modern home or office. The old rooms have been restored and handsomely furnished, and each equipped with lighting fittings appropriate to its character. With such an exhibit the prospective purchaser obtains a correct idea of how the installation will appear in his own home or office.

Business in Boiler-Plant Auxiliaries Good.—The Harrison Safety Boiler Works, Seventeenth Street and Allegheny Avenue, Philadelphia, Pa., reports noting an improvement in its business since the first of the year, the demand for its V-notch meters being especially significant. Such meters have recently been sold to the following: The Bell Telephone Company, the Philadelphia (Pa.) Electric Company, the Logan Light & Power Company, Tiffin, Ohio; the Philadelphia (Pa.) Suburban Gas & Electric Company, the Public Service Electric Company, Newark, N. J., and the Coshocton (Ohio) Light & Heat Company. The boiler company asserts that much of its increased business has been brought about by the realization on the part of operating utilities that profits must hereafter come more largely from increased economies, and that these can be brought about by using feed-water meters and other recording apparatus such as the Harrison company is manufacturing.

Electric Construction Activity in Massachusetts.—The general revival of business and the indirect benefits of the war orders coming to this country are affecting New England plant construction most favorably. The Fred T. Ley Company, Springfield, Mass., is one of the most active contracting establishments now at work in this field, and among the large contracts being rushed to completion are several of electrical interest, such as the building of the largest weave shed in the world for the Naumkeag Mills, Salem, Mass., to be operated entirely by individually driven motors on central-station service; an extension of the generating plant of the Salem Electric Lighting Company to care for the Naumkeag and other new business, and the erection of a dry kiln for the New England Westinghouse Company of Springfield, Mass. Other electrical undertakings on which the company is handling the heavy construction are a power-plant dam for the Turners Falls (Mass.) Power & Electric Company, underground conduit work for the Edison Electric Illuminating Company of Boston, Mass., and work for the Hartford Electric Light Company, the United Electric Light Company of Springfield and the Bristol & Plainville (Conn.) Street Railway.

Holland Buying Electrical Goods Here.—Since the beginning of the war, when the German electrical manufacturing plants which could be spared were turned into munitions factories and all available copper was requisitioned for the service of the army, Holland has called upon the United States to supply her with electrical goods and supplies which were formerly purchased through Berlin, according to Mr. Phil Valk, 51 North Third Street, Jersey City, N. J., who is purchasing agent here for the Holland-Bombay Trading Company and Schuurman & de Jong, both of Amsterdam, Holland. The first-named company does a general trading business in all kinds of supplies, including electrical materials, and has representatives in British India and on the Gulf of Aden and the East Coast of Africa. The firm of Schuurman & de Jong handles electrical equipment only, but is equipped to do designing and consulting engineering work as well. Most of the recent orders for electrical goods from Holland, according to Mr. Valk, relate to wire and cables, stock metal, meters, instruments, motors, arc-lamp electrodes, etc.

An Era of Great Prosperity at Hand, Predicts Mr. McDonald.—Conditions in the business world in the United States to-day are practically identical with the conditions to be found at the end of at least three previous panics, declared Mr. Donald McDonald, vice-president and general manager of the Louisville (Ky.) Gas & Electric Company, in discussing the commercial outlook in a talk at the noon-day luncheon of the Louisville Jovians, July 27. Those same conditions heretofore invariably brought about prosperity or preceded it, said Mr. McDonald, and, according to his view, another era of extraordinary good times is reasonably to be looked for. Even if the European war continues, Mr. McDonald said, this country can count on selling large quantities of foodstuffs, manufactured products, etc., to the belligerents who are now buying, while should the war stop Europe would buy heavily of materials with which to rebuild its ruined cities and bridges, and of stock, seed, etc. The coming fall, Mr. McDonald declared, is not too soon to look for the return of good times, not only comparatively prosperous times, but extraordinary prosperity. In the three panics which he has witnessed, said the speaker, each started when careful investors began withdrawing their money from ventures which were not undoubtedly substantial. Each of them ended when the public exhausted supplies on hand at the time the trouble started, when the merchants disposed of the stocks of goods they had on hand, and when there was little but empty storage space in their warehouses, and, again, when large amounts of money were piling up in the banks and vainly seeking employment. The last set of conditions is exactly what is to be found to-day, declared Mr. McDonald, and great prosperity is reasonably to be looked for soon.

NEW YORK METAL MARKET PRICES

	July 27—Selling Price Bid	July 27—Selling Price Asked	Aug. 3—Selling Price Bid	Aug. 3—Selling Price Asked
Copper	£ s d		£ s d	
London, standard spot*	72 5 0		71 5 0	
Prime Lake	18.50 to 19.00		18.25	to 18.50
Electrolytic	18.25 to 18.50		18.00	to 18.25
Casting	17.00 to 17.25		16.87½	to 17.12½
Copper wire base	20.00†		19.25	to 19.50†
Lead	5.75		5.25	
Nickel	50.00 to 52.00†		50.00	to 52.00†
Sheet zinc, f.o.b. smelter	24.00†		24.00†	
Spelter, spot	18.50 to 18.75†		17.25	to 17.50†
Straits tin	36.00		35.50	
Aluminum, 98 to 99 per cent	32.00 to 33.00		32.00	to 33.00

*OLD METALS

Heavy copper and wire	16.50	16.50
Brass, heavy	11.75	11.75
Brass, light	10.00	10.00
Lead, heavy	4.75	4.65
Zinc, scrap	14.00	13.50

*COPPER EXPORTS

Total tons to Aug. 3 313

*From daily transactions on the New York Metal Exchange.
†Nominal.

New Incorporations

The Jackson Electric Company of Jackson, Ala., has been incorporated with a capital stock of $5,000 by R. V. West, Doel Wright, C. W. Bogles and others.

The Boonville Light, Heat & Power Company of Boonville, Mo., has been granted a charter with a capital stock of $75,000. The incorporators are W. A., R. A. and W. E. Sombart.

The St. Paul Light & Power Company of St. Paul, Va., has been incorporated with a capital stock of $5,000. The officers are: Samuel Wilburn, president, and M. L. Hillman, secretary and treasurer.

The Blue Ridge Power Company of Tuxedo, N. C., has been incorporated with a capital stock of $700,000 by J. O. Bell of Tuxedo; S. B. Tanner of Charlotte, N. C.; W. S. Montgomery, John A. Law and George E. Ladshaw of Spartanburg, S. C.

New Industrial Companies

The Fuller Electrical Appliance Company of Boston, Mass., has been chartered with a capital stock of $50,000. The directors are: Louis D. H. Fuller of Framingham, treasurer; M. F. Maher and F. A. McClaskey.

The Bothwell Electric Company of Youngstown, Ohio, has been chartered with a capital stock of $15,000 to do a general electrical contracting business and deal in electrical fixtures. Howard Bothwell is manager.

The Case Company of Boston, Mass., has been incorporated by Frank K. Bull, Charles A. Snow and N. M. Bates. The company is capitalized at $30,000 and proposes to manufacture and deal in electric and other motor vehicles.

The Volto Electric Company of Cincinnati, Ohio, has been incorporated with a capital stock of $30,000 by Henry F. and Frank J. Grote, P. J. Craig, William Koch and Alfred C. Craig. The company purposes to manufacture and deal in electrical appliances.

The Cattaraugus Engineering Company of Olean, N. Y., has been chartered by Fred J. Kimmey, Carleton Ruhe and F. H. Higgins of Olean, N. Y. The company is capitalized at $5,000 and proposes to do a general electrical and engineering contracting business.

The Molby Boiler Company of Jamaica, N. Y., has been incorporated with a capital stock of $25,000 by E. C. Molby, M. and A. M. Behrer of Jamaica. The company proposes to deal in stoves, boilers, gas and electric appliances and to do a general contracting business.

The L. L. Bates Company of Boston, Mass., has been incorporated with a capital stock of $10,000 for the purpose of manufacturing and installing burglar and fire-alarm systems. The incorporators are Oscar Codding, William E. Nutting and George E. Bradford.

The Ashbrook Electric Company of Chicago, Ill., has been incorporated by Additon A. Righter, W. E. Carr and Frederick Arnd. The company is capitalized at $25,000 and purposes to manufacture and deal in electric storage batteries, generators and electric accessories.

The New York Switch & Panel Board Company of New York, N. Y., has been chartered with a capital stock of $25,000 to manufacture and deal in switchboards, etc. The incorporators are J. Walter Smith, Frederick Weierman, 52 Vanderbilt Avenue, New York, and John F. P. Young, Maspeth, N. Y.

The Dudley Electric & Machine Company of Uniontown, Pa., has been incorporated with a capital stock of $50,000 by W. E. Dudley, Elwood D. Fulton, D. Fulton, W. D. Woodruff, J. T. Dudley of Uniontown, Pa., and Harry E. Street of Clarksburg, W. Va. The company purposes to manufacture boilers and machinery.

The John O. Heinze Company of Springfield, Ohio, has been incorporated by John O. Heinze of Detroit, Mich.; Burton J. Wescott, J. B. Cartmell, George E. Kelly and L. H. Cook, all of Springfield. The company is capitalized at $500,000 and proposes to manufacture a newly patented starter for automobiles and other electrical appliances.

Trade Publications

Electric Iron.—The American Electrical Heater Company, Detroit, Mich., has issued an illustrated folder on its "Rite-Heat" electrically operated iron.

Lighting Rates.—"The Story of Lighting Rate C" is the subject of a booklet prepared by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa.

Telephone Cable.—The Standard Underground Cable Company, Pittsburgh, Pa., has prepared a booklet entitled, "Pointers on Telephone Cable Specifications."

Portable Testing Sets.—The Queen-Gray Company, Philadelphia, Pa., has issued Bulletin E-6 on portable testing sets and instruments for maintenance of lines and cables.

Graphite Brushes.—The Joseph Dixon Crucible Company, Jersey City, N. J., has recently published a booklet which contains information on graphite brushes for commutators.

Receptacles and Plugs.—The Bryant Electric Company, Bridgeport, Conn., has prepared an illustrated folder which contains information on its "Junior" receptacles and plugs.

Cordless Vestibule-Telephone Set.—The Connecticut Telephone & Electric Company, Meriden, Conn., is sending out Bulletin No. 50 on its vestibule telephoning outfit for apartment houses.

Indicating Inclosed Fuses.—The Detroit Fuse & Manufacturing Company, 1400 Rivard Street, Detroit, Mich., is sending out an illustrated folder on its "Arkless" indicating inclosed fuses.

Semi-Indirect Lighting Fixtures.—The Luminous Unit Company, St. Louis, Mo., is sending out an illustrated leaflet containing information on its "Brascolite" semi-indirect lighting fixture.

Fused Switch.—Berry, Skinner & Company, 78 Upper Thames Street, London, E. C., England, have issued List No. 4151, which contains information on their "Adanac" switch and repulsion fuse.

Steel-Plate Exhauster.—Bulletin No. 6, Series 2, published by the American Blower Company, Detroit, Mich., describes and illustrates its types E, L and C "A B C" steel-plate exhausters.

Small Generating Plant.—The L. B. Jones Company, Kansas City, Mo., has prepared several illustrated bulletins the subject of which is a self-contained gasoline-engine-driven generating unit.

Time Switches.—Electrically operated time switches for window, sign, and street lighting are the subject of an illustrated catalog issued by the National Time Switch Company, South Bend, Ind.

Motor-Driven Machines.—"Flashes from a Live Wire" is the title of a booklet recently issued by the Robbins & Myers Company, Springfield, Ohio, which contains information on machines operated by small motors.

Oil Filters.—The Famous Filter Company, 308 North Commercial Street, St. Louis, Mo., has prepared an illustrated catalog which describes various types of steam-jacketed and electrically heated oil filters and purifiers.

Election Suction Sweeper.—The Hoover Suction Sweeper Company, New Berlin, Ohio, has prepared a booklet which is illustrated in colors and which contains information on its combined electrically operated sweeper and suction cleaner.

Centrifugal Blowers and Compressors.—The De Laval Steam Turbine Company, Trenton, N. J., is sending out a sixty-four-page catalog on its centrifugal blowers and compressors for pressures from 5 in. of water up to 125 lb. per sq. in.

Fiber Products.—The Diamond State Fiber Company, Elsmere, Del., has issued Bulletin No. 11, entitled "Automobile Specialties," and Bulletin No. 12, entitled "Vulcanized Fiber Receptacles," both of which contain information on various types of fiber devices.

Electrical Instruments and Circuit-Breakers. — The Roller-Smith Company, 203 Broadway, New York, has issued data sheets A to H inclusive on several of its electrical instruments and circuit-breakers. The company has also prepared an illustrated folder on its precision torsion balances for weighing lamp filaments.

Construction News

New England

MILTON, N. H.—A company is being organized, to be known as the Milton Electrical Co., to supply electrical service here. The old Worster mill site has been secured by J. B. Giguere, the promoter of the project, for the location of the power house. The town has also contracted, it is reported, for street-lighting service.

BROCKTON, MASS.—A petition has been filed by Henry W. Safford and others with the Board of Aldermen asking that a commission be appointed to make investigations and report on the feasibility of establishing a municipal electric-light plant in Brockton.

GREENFIELD, MASS.—The Harbor and Land Commission has granted the petition of the Greenfield El. Lt. & Pwr. Co. to lay cables in the Connecticut River above the Montague City bridge. Specifications call for steel-armored cables to be laid 2 ft. below the surface of the river bed.

WESTFIELD, MASS.—At a town meeting held recently the sum of $25,000 was voted for improvements to the municipal electric-lighting plant as follows: For new overhead cable and extensions, $11,500; new coal trestle, $5,000; new oil and storehouse and extensions to gas holders and benches.

CRANSTON, R. I.—Bids will be received by the committee on city property at the office of the city clerk, City Hall, Cranston, until Aug. 10 for general heating, plumbing and lighting contracts for any or all of the following: A schoolhouse of six rooms and assembly hall on Green Street, an addition of four rooms to schoolhouse on Princess Avenue, and an addition of two rooms to Meshanticut Park schoolhouse.

CANAAN, CONN.—Rights-of-way have been filed by the Connecticut Pwr. Co. of New London in the office of the town clerk at Berlin for the high-tension transmission line from Falls Village to Middletown. The line will pass through Plainville and Berlin.

Middle Atlantic

CLAVERACK, N. Y.—The power plant of the Knickerbocker Cement Co. in Claverack was destroyed on Aug. 2 in a landslide caused by quicksand. The loss is placed at $250,000.

CLAYTON, N. Y.—The Northern New York Utilities Co. of Watertown has submitted a proposal to the Village Council for replacing the arc lamps now in use with nitrogen-filled lamps. The company is also negotiating with the Council to furnish electricity to operate the water-pumping station. The substation and high-tension transmission line of the company is nearly ready for operation.

FREDONIA, N. Y.—The Niagara & Lake Erie Pwr. Co. of Fredonia has applied to the Public Service Commission for permission to erect electric transmission lines in the town of Evans and the village of Brocton.

LESTERSHIRE, N. Y.—Preparations are being made by Endicott, Johnson & Co. to double the output of their main power plant in Lestershire, including the installation of a 2000-kw. steam turbine.

NEW LEBANON, N. Y.—The Lebanon Valley Ltg. Co. has applied to the Public Service Commission to erect electric transmission lines in portions of the towns of Canaan and New Lebanon and for approval of franchises; also for authority to issue capital stock.

SILVER CREEK, N. Y.—A joint petition has been presented to the Public Service Commission by the Silver Creek El. Co. and John Kimball as to transfer of franchise, the company asking for authority to exercise the franchise.

ALTOONA, PA.—The Penn Central El. Lt & Pwr. Co. of Altoona has recently closed a contract with the Pennsylvania Coal & Coke Corpn. to equip its mine No. 39 for electrical operation. The initial installation will requre about 450 hp.

HARRISBURG, PA.—The Public Service Commission has approved the following contracts: The Cambria Lt., Ht. & Pwr. Co. and the borough of Patton, for furnishing electricity for lamps, heaters and motors in Patton; New Castle El. Co. of New Castle and the township of Union, township of Taylor, city of New Castle and the township of Shenango, to supply electricity for lamps, heaters and motors in those places.

PITTSBURGH, PA.—The Federal Street & Pleasant Valley R.R. Co. of Pittsburgh has been granted a permit to construct a power house in Taggart Street, North Side, Pittsburgh, to cost about $2,750.

PITTSBURGH, PA.—Arrangements have been made whereby the residents of the towns of Meridan and Miller will have electrical service to be furnished by the Pittsburgh, Harmony, Butler & New Castle Ry. Co. of Pittsburgh. The company agrees to provide electricity for a distance of not more than 1000 ft. from its traction line. Harry Etheridge of Eidenau is superintendent.

BLOOMFIELD, N. J.—The Westinghouse Lamp Co., it is reported, is contemplating building an addition to its power house in the Watsessing section.

VENTNOR CITY, N. J.—The Council has awarded the contract for furnishing and erecting ornamental iron posts for the illumination of the boardwalk to the Central Station Equip. Co. The contract has not yet been awarded for lamp standards for Ventnor Avenue. E. Steelman is city clerk.

CUMBERLAND, MD.—Edward L. Williams, 10 North Liberty Street, Cumberland, it is reported, is contemplating the development of a water-power. As yet no definite steps have been taken.

PARKERSBURG, W. VA.—The Kanawha Trac. & El. Co. of Parkersburg, it is reported, is contemplating extending its electric-lighting service throughout Williamstown.

FAIRFIELD, VA.—Plans are being prepared, it is reported, by the Fairfield El. Lt. & Pwr. Co., recently incorporated, for the construction of a power plant for the purpose of supplying electricity in Highland Springs and other parts of Fairfield district. G. T. Collins is president.

ORANGE, VA.—Bids will be received by Frank B. Perry, Mayor, until Aug. 16 for an electric-lighting franchise.

WASHINGTON, D. C.—Bids will be received at the office of the Commissioners of the District of Columbia, Room 509, District Building, Washington, until Aug. 24 for furnishing underground signal and telephone cable for use of the Electrical Department of the city. Specifications and form of proposal may be obtained from purchasing officer, Room 320, District Building, Washington.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 24 for furnishing at the various navy yards and naval stations the following supplies: Brooklyn, N. Y., Schedule 8654—8000 ft. interior communication cable, 1800 ft. telephone cable, 200,000 ft. double-flexible silk conductor, miscellaneous twin conductor wire, miscellaneous silicon bronze wire; Schedule 8636—miscellaneous seamless drawn-steel pipe; Schedule 8653—miscellaneous seamless drawn-copper tubing. Boston, Mass., Schedule 8642—eight watt-hour meters. Newport, R. I., Schedule 8634—two nonreversible direct-current motors. Washington, D. C., Schedule 8644—385 chestnut telephone poles, 30 ft. long. Portsmouth, N. H., Schedule 8653—miscellaneous seamless brass pipe. Norfolk, Va., Schedule 8653—seamless steel boiler tubing. Bids will also be received until Aug. 31 as follows: Mare Island, Cal., Schedule 8630—5-hp. motors and controllers (two each). Brooklyn, N. Y., Schedule 8629—two 10-kw. radio transmitters. Puget Sound, Wash., Schedule 8647—4000 lb. tubing composition. Applications for proposals should designate the schedule desired by number.

North Central

AHMEEK, MICH.—The contract for the installation of the waterworks system in Ahmeek is reported to have been awarded to the Smith-Byers-Sparks Company of Houghton. The pumping station will be equipped with electrically driven machinery. The cost of the work is estimated at about $18,000.

CORUNNA, MICH.—The local electric-light plant of the Consumers' Pwr. Co. of Owosso is reported to have been destroyed by fire on July 31, causing a loss of about $15,000.

WYANDOTTE, MICH.—Estimates providing for an expenditure of $29,625 for proposed improvements to the municipal electric-light plant and $11,025 for waterworks system have been approved by the City Commission.

AKRON, OHIO—The Firestone Tire & Rubber Co. of South Akron is planning to install an electric plant to supply electricity for lamps and motors for its factory, and it is reported is contemplating furnishing energy to parties in that neighborhood. Bids, it is understood, have been asked for equipment.

CANTON, OHIO.—The Council has passed an ordinance requiring all overhead wires, with the exception of trolley wires and the necessary guy wires, on Tuscarawas Street West to be removed by Dec. 1.

CINCINNATI, OHIO.—Plans are being prepared by Bernard T. Wisenall, architect, for the construction of a 75-ton ice plant at Price Hill, to cost about $75,000.

CLEVELAND, OHIO—Bids will be received at the office of the commissioner of purchases and supplies, Room 511, City Hall, Cleveland, until Aug. 13 for furnishing nitrogen-filled tungsten lamps for the municipal Electric Light Department. Bids will also be received at the same time and place for hard-drawn copper busbars for the municipal Electric Light Department. Specifications may be obtained at the office of the commissioner of light and heat division, 1443 Third Street.

COSHOCTON, OHIO.—Bids will be received by the County Commissioners of Coshocton County, Coshocton, Ohio, until Aug. 19 for the installation of both single and cluster lamps. For details see proposals columns.

DAYTON, OHIO.—The Board of County Commisioners, it is reported, has adopted resolutions providing for the construction of a new power house and installation of new boilers at the Montgomery County Children's Home, to cost about $10,000.

DEFIANCE, OHIO.—The Defiance Gas & El. Co. expects to purchase within the next three months 100 electric meters and 75 gas meters. W. P. Wallace is general manager.

GREEN CAMP, OHIO—Bonds to the amount of $5,000 have been voted for the installation of an electric-lighting system. It is not yet decided whether a plant will be built in Green Camp or a transmission line erected from Marion.

KENT, OHIO.—Within the next 30 days the Kent Wtr. & Lt. Co. expects to purchase one 72-in. by 18-ft. boiler. S. F. Messer is superintendent.

SPRING VALLEY, OHIO.—The Council has granted the Dayton Pwr. & Lt. Co. of Dayton a franchise to furnish electricity in Spring Valley.

HAZARD, KY.—Howard N. Eavenson and Edward O'Toole of Gary, W. Va., it is reported, are organizing a company to acquire the plant of the East Tennessee Coal Co. The new company proposes to install an additional unit to furnish energy to coal mines during the development and construction of a large central power station and transmission system. A transmission line will be erected from the plant of the Tennessee company through Hazard to First Creek, directly through the coal field, with various branches. R. L. Cornell, Wootton & Morgan Building, Hazard, is in charge of the work.

BRAZIL, IND.—Steps have been taken by the City Council to secure estimates of cost and ascertain the feasibility of establishing a municipal electric-lighting plant in Brazil.

INDIANAPOLIS, IND.—The Merchants' Ht. & Lt. Co. of Indianapolis is installing a double-loop system in the downtown districts to avoid break-downs and is also laying underground conduits for electric cable in Washington Street and some adjacent alleys. The new line will connect the Pearl Street and the Washington Street plants.

INDIANAPOLIS, IND. — Arrangements are being made for the installation of the new ornamental lighting system in the downtown district. The cluster lamps now in use will be replaced with single arc lamps mounted on iron standards. Several extensions will be made in this district and requests for further extensions will be considered by the Board of Public Works.

AUBURN, ILL.—The City Council is contemplating the installation of an ornamental lighting system in the business district, to cost about $6,000.

CEDARVILLE, ILL.—The Cedarville Park Pwr. & El. Co., recently incorporated, proposes to develop the village of Cedarville into a summer resort. The company will own and operate hotels, etc., as well as an electric-light and power plant.

CHICAGO, ILL.—Bids will be received by the Second Infantry Regiment Armory Commission at the office of James B. Dibelka, State Architect, 130 North Fifth Avenue, Chicago, until Aug. 11 for addition to armory now under construction for the Second Infantry Regiment Armory, Illinois National Guard, Chicago. Separate bids will be received for general work, plumbing, heating and electric wiring.

CLINTON, ILL.—Preparations are being made by the Clinton Gas & El. Co. for the erection of a 6-mile, three-phase, 13,200-

volt transmission line, erected on steel towers, to Albany and to the Meredosia Drainage District. Substations (outdoor type) will be erected in Clinton and on the Illinois shore of the Mississippi River. Equipment, including two 150-hp., three-phase motors, wire, poles, etc., and transformers, etc., for outdoor substations, will be required. The company is now open for bids for the work. Thomas Crawford is engineer in charge.

EDWARDSVILLE, ILL.—The contract for lighting fixtures for the Madison County court house has been awarded to the Gross Chandelier Co. of St. Louis, Mo., at $6,000.

ROCKFORD, ILL.—The City Council has instructed Ross P. Beckstrom, superintendent of the water-works system, to make investigations and submit a report on the cost of establishing a municipal electric-light plant, which will also supply energy to operate the city pumping station.

ROCKFORD, ILL.—Bids will be received by the board of trustees of the Municipal Tuberculosis Sanitarium, city of Rockford, at the office of the Board of Health, until Aug. 12, for furnishing and installing a deep-well plunger pump of 70 gal. per minute capacity, including power head, driven by horizontal motor; also automatic control for said motor, and pneumatic pressure tank, necessary switchboards, inside wiring and accessories. Dr. H. A. Pattison is secretary.

STREATOR, ILL.—An ornamental street-lighting system, it is reported, will be installed on Main Street from the river to the Santa Fé railroad station. Single lamp standards, it is understood, are favored.

LUXEMBOURG, WIS.—The city of Luxembourg is contemplating the installation of an electric-lighting plant.

MADISON, WIS.—The city of Madison, it is reported, contemplates the installation of an ornamental lighting system, consisting of 140 500-watt lamps.

MADISON, WIS.—Bids will be received by the Capitol Commission, Madison, until Aug. 24 for furnishing labor and materials for the elevator work for the north wing of the Wisconsin State Capitol, now under construction. Plans and specifications are on file in the office of George B. Post & Sons, architects, 101 Park Avenue, New York, N. Y., and at the office of the Capitol Commission, Madison.

GRANITE FALLS, MINN.—Bids will be received by the State Board of Control, State Capitol, St. Paul, until Aug. 18 for construction of a tuberculosis sanitarium for the counties of Chippewa, Lac qui Parle, Renville and Yellow Medicine, including general construction, reinforced concrete chimney, mechanical equipment and deep well. Plans and specifications may be seen at the offices of Sund & Dunham, architects, Essex Building, and Rose & Harris, engineers, Minneapolis.

HARDWICK, MINN.—Bids will be received by the village recorder, Hardwick, until Aug. 17 for furnishing material and erecting an electric transmission line and distribution system for the village of Hardwick. Plans and specifications are on file in the office of the recorder, Hardwick, and also at the office of Earle D. Jackson, consulting engineer, Capital Bank Building, St. Paul.

MINNEAPOLIS, MINN.—Bids will be received at the office of G. A. Sandberg, purchasing officer, University of Minnesota, Minneapolis, until Aug. 20 for two 350-hp. return water-tube boilers installed complete with stokers. Plans and specifications are on file in the office of the superintendent of buildings and grounds, Room No. 4, Mechanic Arts Building, University Campus.

ST. JAMES, MINN.—The Consumers' Pwr. Co. of St. Paul has secured a contract to supply energy to operate the municipal electric-light and power system in St. James. Work will begin at once on the erection of the transmission line from Madelia to St. James, a distance of 14 miles. The local plant will be closed down as soon as connection with the power company's lines is accomplished.

ST. PAUL, MINN.—The Faribault division of the Consumers' Pwr. Co. has been granted a franchise to supply electricity in the village of Eagle Lake, which is located about 6 miles from Madison Lake, now served by the Faribault division. Work will be started at once on the transmission line. The village of Hampton has asked the company to extend its service to that community.

VERNDALE, MINN.—Bids will be received by W. N. Morell, clerk of school board, Verndale, until Aug. 13 for construction of school building at Verndale, including general contract, heating, plumbing, electric wiring and a 4-in. deep well. Plans are on file in the offices of F. C. W. Kuehn, architect, Huron, S. D., the clerk of school board, Verndale, and the Builders' Exchange, Minneapolis.

WHEATON, MINN.—Bids will be received at the office of the Board of Education, Wheaton, until Aug. 16, for plumbing, heating, ventilating and electric wiring of a gymnasium and manual training building, including material and labor. Plans and specifications may be obtained upon application to E. F. Broomhall, architect, 710 Alworth Building, Duluth, upon deposit of $20.

DAVENPORT, IOWA.—Bids will be received at the office of J. D. McCollister, secretary of board of education, 1144 Main Street, Davenport, until Aug. 12 for construction of Manual Training School building; separate bids to be submitted for plumbing, heating apparatus and electric wiring. Plans and specifications are on file in the office of Clausen & Krause, Central Office Building, Davenport.

LUANA, IOWA.—Bids will be received by Henry Palar, president of board, Luana, until Aug. 28 for construction of the new consolidated school to be erected at Luana by the Consolidated Independent School District, including general construction, heating and plumbing, electrical work and fixtures, manual training, domestic science and gymnasium equipment. Plans and specifications may be obtained at the office of Alban & Lockhart, architects, Endicott Building, St. Paul, Minn., upon deposit of $10.

MARSHALLTOWN, IOWA.—The Board of County Supervisors has granted the Iowa Ry. & Lt. Co. of Marshalltown permission to erect a high-tension transmission line from Le Grand to Gilman.

BLUE SPRINGS, MO.—The local electric-light and ice plant was destroyed by fire on July 29, causing a loss of about $9,000. Arrangements, it is stated, are being made to rebuild the plant.

ENDERLIN, N. D.—The Enderlin El. Lt. & Pwr. Co. expects to erect within the next four months 7 miles of three-phase transmission line to connect with Sheldon; also to purchase material for distribution system and lighting system, including poles, wire and transformers, and street-lighting fixtures for a town of from 600 to 700. The company also expects to purchase within the next six months one 12-in. by 30-in. or 14-in. by 36-in. Corliss engine and 90 ft. of three-ply 16-in. belting. F. A. Barnard is chief enginer.

PARK RIVER, N. D.—Within the next two months the Electric Light and Waterworks Department expects to purchase poles, wires and transformers for two feeder lines, each about ½ mile long. A 75-kva., 2300-volt generator, manufactured by the El. Mach. Co., and one General Electric slate switchboard, complete with oil switches and overload trip, have recently been installed in the municipal plant. A. E. Mullineaux is superintendent.

VELVA, N. D.—Within the next three months the Velva Ser. Co. expects to build an addition to power house, erect 7 miles of transmission line and install substation equipment; also to purchase one 150-hp. lignite producer, one 100-hp. producer-gas engine, one 90-kva., three-phase, 60-cycle generator (directly connected) and complete switchboard equipment; also complete equipment for 7 miles of 6600-volt transmission line. O. J. Kauffman is owner and manager.

FRANKLIN, NEB.—At an election held recently the proposal to issue $7,000 electric-light bonds was carried.

NELIGH, NEB.—S. F. Gilman, owner of the Neligh Mills, which supplies electrical service in Neligh, is installing a 225-hp. Diesel oil engine. All material for installation has been purchased.

NORTH PLATTE, NEB.—At an election to be held Aug. 31 the proposal to issue bonds for improvements to the street-lighting system will be submitted to the voters.

SCOTTSBLUFF, NEB.—The C. & R. El. Co. of Scottsbluff is installing a 150-hp. boiler and is erecting an addition to power house (40 ft. by 48 ft.). The company also expects to purchase material for district steam-heating plant. F. H. Roberts is owner and manager.

SEWARD, NEB.—The City Council has decided to rebuild the municipal electric-light plant recently destroyed by fire. The cost of the work is estimated at $12,000.

ATTICA, KAN.—Plans, it is reported, are being prepared for the construction of a municipal electric-light plant, to cost about $15,000. F. H. Kelburn of Woodward, Okla., is engineer.

HAVEN, KAN.—Within the next two months the Haven El. Lt. & Ice Co. expects to purchase underground conduits and lamp-posts.

HAVILAND, KAN.—The City Council has entered into a contract with the city of Greensburg for electricity from the municipal plant in Greensburg for lighting the streets and for commercial purposes in Haviland. This city will install the electric distributing system, switchboard and other necessary equipment. Contracts will be awarded soon. E. T. Archer & Co., New England Building, Kansas City, Mo., are electrical engineers. L. D Mitchell is city clerk.

MUSCOTAH, KAN.—Bonds to the amount of $8,000 have been voted for the erection of an electric transmission line from Atchison to Muscotah.

Southern States

APEX, N. C.—The town of Apex has granted the Municipal Service Corpn. a franchise to construct and operate an electric-lighting plant, water-works and sewerage system. The cost of the work is estimated at $40,000. John Bray of Raleigh will be engineer in charge.

KINSTON, N. C.—Improvements, it is reported, are contemplated to the municipal electric-lighting system, involving an expenditure of about $40,000.

COOLIDGE, GA.—At an election to be held Aug. 16 the proposal to issue $4,500 in bonds for the installation of an electric-lighting system will be submitted to the voters.

COLUMBIA, TENN.—The Columbia Wtr. & Lt. Co., it is reported, will soon award contract for the installation of a new street-lighting system; an ornamental system consisting of 60 standards will also be installed. J. S. Robinson is superintendent.

ANNISTON, ALA.—The Alabama Pwr. Co. of Birmingham is reported to be contemplating the erection of a high-tension transmission line (44,000 volts) from Anniston to Piedmont.

JACKSON, ALA.—The Jackson El. Co., recently incorporated with a capital stock of $5,000, is building an electric-light plant and distributing system in Jackson, at a cost of about $20,000. The company has been awarded a contract for lighting the streets of the city for a period of 30 years.

RINGLING, OKLA.—The installation of a municipal electric-light plant and water-works system in Ringling is under consideration.

DALLAS, TEX.—The commissioners' court of Dallas County has awarded the contract for rewiring the old court house to the F. E. Newberry Co. of Dallas at $7,000.

HOLLAND, TEX.—The city of Holland is reported to have awarded the Texas Pwr. & Lt. Co. of Dallas a contract to furnish electricity for lighting purposes. The company is erecting a transmission line from Waco to Austin, passing through Holland.

Pacific States

ASHLAND, ORE.—Negotiations are under way between the city of Ashland and the California-Oregon El. Lt. & Pwr. Co. with a view to the purchase of the company's distributing system in Ashland, to be operated in connection with the municipal lighting system.

SILVERTON, ORE.—Failing on two calls to receive satisfactory bids for lighting the streets of the city, the City Council has engaged Prof. C. R. Reid of the University of Oregon to prepare estimates of costs and to make investigations as to the feasibility of establishing a municipal electric-light plant.

REDDING, CAL.—The plant of the Redding El. Lt. & Pwr. Co., a subsidiary of the Northern California Lt. & Pwr. Co. of San Francisco, was destroyed by fire on July 25, causing a loss of about $8,000.

SAUSALITO, CAL.—The Town Trustees have adopted a resolution providing for the installation of an electrolier lighting system, consisting of sixty-five lamp standards, on several streets in this city.

ARCO, IDAHO.—We are informed that Ralph Edmunds of Idaho Falls has not applied for a franchise to install an electric plant in Arco and is not interested in work of any kind here. Reported in the issue of July 17 that Ralph Edmunds and B. Clarke of Idaho Falls had applied for a seven-year franchise to install an electric-light plant and water-works system in Arco.

SALT LAKE CITY, UTAH.—The property holders of Yale Park have decided to light Yale Avenue with either gas or electric lamps.

ANACONDA, MONT.—The City Council is reported to have adopted resolutions creating Improvement Districts 66 and 69, providing for the installation of ornamental lamps. The system proposed in District 66 will cost about $3,900 and that in District 69 approximately $4,000.

BOZEMAN, MONT.—The Council is reported to have created District 100, providing for the installation of ornamental lamps on Main Street between Ida and Fourth Avenues.

SANTA ROSA, N. M.—Plans, it is reported, are being prepared by Burns & McDonnell, Scarritt Building, Kansas City, Mo., for the proposed municipal electric-light plant and water-works system in Santa Rosa.

Canada

BEVERLY TOWNSHIP, ONT.—The Township Council has passed a by-law providing $4,495 for the installation of a hydroelectric plant.

HARRISTON, ONT.—At an election held July 26 the by-law authorizing a contract with the Ontario Hydro-Electric Power Commission was carried.

Miscellaneous

PEARL HARBOR, HAWAII—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 28 for three hydro-pneumatic freight elevators, installed complete, at the naval station, Pearl Harbor, Hawaii. Plans and specifications may be obtained on application to the above bureau or to the commandant of the naval station named.

PANAMA—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Aug. 20 as follows: For steel reinforcing bars, staples, cable clips, chain blocks, tackle blocks, steel cargo trucks, anchor lights, etc. Blanks and general information relating to this circular (No. 958) may be obtained from the above office or from the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

PANAMA—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Aug. 9, under file R1388-Y, for furnishing 3440 ft. 750,000-circ. mil, single-conductor, rubber-insulated, lead-covered armored cable, not served; 1080 ft. 300,000-circ. mil, single-conductor, rubber-insulated, lead-covered, armored cable, not served; 1300 ft. 300,000-circ. mil, single-conductor, lead-covered, armored and served cable for submarine use; 820 ft. 168,000-circ. mil, single-conductor, rubber-insulated, lead-covered cable; 120 ft. 168,000-circ. mil, single-conductor, rubber-insulated, lead-covered, armored and served cable; 1100 ft. 66,400-circ. mil, two-conductor, rubber-insulated, lead-covered cable; 5300 ft. nine-conductor, rubber-insulated, lead-covered cable; 4250 ft. nine-conductor, rubber-insulated, lead-covered, armored and served cable, and 500 ft. nine-conductor, rubber-insulated braided cable. For further information address Major F. C. Boggs, general purchasing officer.

Directory of Electrical Associations

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C. Meeting, San Francisco Aug. 2-7.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. Meeting, San Francisco, Sept. 16-18.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, Eugene W. Stern, 101 Park Ave., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. Secretary, William H. Ross, 154 Nassau St., New York City.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary-treasurer, Roy B. Fowles, Pine Bluff, Ark.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General secretary, C. E. Dustin, 62 Cedar St., New York.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, George C. Holberton, San Francisco, Cal. Annual convention, Spring Lake, N. J., Sept. 13-16.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, W. T. Snyder, McKeesport, Pa. Annual meeting, Hotel Statler, Detroit, Sept. 8-11.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. S. Hanbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, Alan Sullivan, 10 Adelaide Street East, Toronto, Can.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col. Annual convention, Glenwood Springs, Sept. 23-25.

COMMERCIAL SECTION, N. E. L. A. Secretary, C. A. Littlefield, 130 East 15th St., New York.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, Lee Hagood, General Electric Co., Schenectady, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF ILLINOIS. Secretary, H. E. Chubbock, Peoria, Ill.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE STATE OF PENNSYLVANIA. Secretary, M. G. Sellers, 1518 Sansom St., Philadelphia.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, A. D. Page, 30 Church St., New York.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Quarterly meeting Niagara Falls, Ont., Sept. 14-16.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Executive secretary, A. Jackson Marshall. 29 West 39th St., New York. Sections in New York, New England, Chicago, Philadelphia, Washington and Los Angeles.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Wier, Athens, Ga.

ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. J. Burns, Moline, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, C. A. Littlefield, 29 West 39th St., New York. Annual convention, New Willard Hotel, Washington, D. C., Sept. 20-23.

INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA. Secretary, W S. Vivian, 19 South LaSalle St., Chicago.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skilman, Indianapolis, Ind.

INDUSTRIAL ELECTRIC HEATING ASSOCIATION. Secretary, Homer Kunz, Toledo Railways & Light Co., Toledo, Ohio.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, David Sarnoff, 71 Broadway, New York.

INTERNAL COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 West Indiana St., Chicago. Meeting second Friday of each month at Lewis Institute.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex. Next annual convention, Cincinnati, Aug. 24-26.

INTERNATIONAL ENGINEERING CONGRESS. Secretary-treasurer, W. A. Cattell, Foxcroft Building, San Francisco, Cal. Congress, San Francisco, Sept. 20-25.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England. Meeting at San Francisco, Sept. 9-11.

IOWA SECTION, N. E. L. A. Secretary, W. H. Thompson, Des Moines, Ia.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Ia.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia.

JOVIAN ORDER. Jupiter (president), Homer E. Niesz, Chicago, Ill.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Mercer, 108 West 8th Ave., Topeka, Kan

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St. Meeting every Wednesday, Audubon Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MICHIGAN SECTION, N. E. L. A. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, G. M. Jones, 14 Seventh St. N., Minneapolis, Minn.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the National Electric Light Association. Secretary-treasurer, H. F. Wheeler, Hattiesburg, Miss.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer. Wm. L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y. Executive meeting, Washington, D. C., October.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederick P. Vose, 1343 Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Permanent headquarters, Room 204, Hotel LaSalle, Chicago, Ill.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, S. J. Bell, David City, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass. Annual convention, Mount Kineo House, Kineo, Maine, Sept. 14-17.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell, N. M.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 365 East 21st St., Brooklyn, N. Y.

NORTHWEST SECTION, N. E. L. A. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash. Annual meeting, Portland, Ore., Sept. 8-11.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary-treasurer, J. W. Oberender, 502 Dekum Bldg., Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, H. N. Müller, 435 Sixth Av., Pittsburgh, Pa. Annual meeting, Bedford Springs, Pa., Sept. 8-10.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davis, West Virginia Water & Electric Co.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTHWESTERN SECTION, N. E. L. A. Secretary-treasurer, George H. Wygant, Tampa, Fla. Annual meeting, Asheville, N. C., Sept. 22-24.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

TRI-STATE WATER & LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 Jackson Blvd., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JULY 27, 1915.

[Prepared by Mitchell & Allyn, 41 Park Row, New York.]

1,147,700. AUTOMATIC ARC-LAMP CUT-OUT; J. E. Boesch, Vancouver, British Columbia, Canada. App. filed Dec. 22, 1913. Automatically closes switch if lead wires should be accidentally disconnected.

1,147,701. AUTOMATIC LAMP CUT-OUT; J. E. Boesch, Vancouver, British Columbia, Canada. App. filed Dec. 22, 1913. Lead wires actuate cut-out upon lowering of lamp.

1,147,703. ELECTRIC FURNACE; J. W. Brown, Lakewood, Ohio. App. filed Jan. 8, 1912. For manufacture of graphite.

1,147,716. AUTOMATIC TELEPHONY; C. L. Goodrum, Athens, Ga. App. filed June 18, 1912. Simplified selector switches and contacts.

1,147,717. LAMP RECEPTACLE; E. F. Guth, St. Louis, Mo. App. filed Jan. 21, 1915. Simplicity of "open-terminal" socket with safety of "closed-terminal" socket.

1,147,718. PROCESS OF PLATING ALUMINUM; J. A. Hall, New Britain, Conn. App. filed Feb. 5, 1915. Cleanses electroplates in zinc bath, and then applies coating of some other metal.

1,147,753. DRY BATTERY; L. J. Schatzel, Fostoria, Ohio. App. filed Dec. 19, 1910. Potassium persulphate depolarizer.

1,147,757. INSULATOR-SUPPORTING STRUCTURE; C. P. Seyler, Pittsburgh, Pa. App. filed May 4, 1914. "Bow-and-arrow" type for three-wire system.

1,147,783. METHOD OF TREATING METAL; E. C. Carter, Dayton, Ohio. App. filed Nov. 13, 1913. Spot-hardening steel-coated electrodes.

1,147,789. ELECTRICAL HEATING UNIT; R. W. Davenport, Detroit, Mich. App. filed Feb. 13, 1914. Volute-coiled resistor with thermo filling between convolutions.

1,147,795. ALARM DEVICE ON WINDOWS; C. W. Ervin, Los Angeles, Cal. App. filed June 30, 1914. Inserted into grooves cut in sash.

1,147,820. ELECTROPNEUMATIC SWITCH; W. M. Scott, Philadelphia, Pa. App. filed July 22, 1910. Pneumatically operated switch controlled by an electropneumatic valve.

1,147,829. WARNING INDICATOR FOR VEHICLES; F. Triest, San Francisco, Cal. App. filed Feb. 3, 1914. Motor swings indicator disk.

1,147,847. ELECTRIC VULCANIZER; O. C. Dennis, Chicago, Ill. App. filed July 20, 1914. Small and low-voltage, for roadside repairs.

1,147,864. AUTOMATIC TELEPHONE SYSTEM; D. S. Hulfish, Toronto, Ontario, Canada. App. filed March 29, 1911. Multiple "searching" brush.

1,147,870. WIRE CLAMP; W. H. Kempton, Mansfield, Ohio. App. filed Aug. 10, 1911. For supporting trolley wires.

1,147,895. TELEPHONE SYSTEM; N. C. Schellenger, Chicago, Ill. App. filed Feb. 24, 1903. No leaks or shunts across the line.

1,147,916. ELECTRIC HEATER; A. O. Bailey, New York, N. Y. App. filed Aug. 6, 1914. For car heating.

1,147,917. ELECTRIC HEATER; A. O. Bailey, New York, N. Y. App. filed Sept. 12, 1914. Special construction for mounting beneath car cushions.

1,147,928. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; H. G. Dietl, Vienna, Austria-Hungary. App. filed Feb. 23, 1909. Reduces and simplifies central-office apparatus.

1,147,949. PILOT AND NIGHT LAMP; E. Keen, Brooklyn, N. Y. App. filed Jan. 16, 1914. Pilot lamp on end of pull cord.

1,147,950. AUTOMOBILE DIRECTION INDICATOR; Z. Keough, Los Angeles, Cal. App. filed Dec. 8, 1913. Solenoid-operated indicating arrows.

1,147,951. ELECTRIC HEATER; F. T. Kitchen, New York, N. Y. App. filed Aug. 6, 1914. Readily removable heating units for car heating.

1,147,952. ELECTRICAL HEATER; F. T. Kitchen, New York, N. Y. App. filed Aug. 28, 1914. Unit construction.

1,147,956. SELF-STARTER FOR INTERNAL-COMBUSTION ENGINES; W. D. Lutz, Allendale Borough, N. J. App. filed Oct. 8, 1913. Conductor magnetic starting clutch.

1,147,989. ELECTRICAL LIQUID PURIFIER; A. A. Towne, Long Beach, Cal. App. filed March 1, 1915. Has a shiftable electrode to vary amount of current.

1,147,997. CONVERSATION-REGISTERING CIRCUITS FOR MACHINE-SWITCHING TELEPHONE SYSTEMS; F. Alendorff, Mortsel, near Antwerp, Belgium. App. filed June 30, 1913. Uses straight battery currents.

1,148,014. FIRE-ALARM SYSTEM; F. Gottschalk, Stirling, N. J. App. filed Feb. 13, 1914. Attaches to telephone desk set.

1,148,044. CLIP DEVICE; J. G. Peterson, Jersey City, N. J. App. filed March 30, 1914. Terminal for snap switches.

1,148,126. SPEED RECORDER; S. B. Storer, Syracuse, N. Y. App. filed May 24, 1910. Records average speed of revolving element for given periods.

1,148,137. SIGNAL DEVICE FOR AUTOMOBILES; J. F. Anderson, Seattle, Wash. App. filed Jan. 8, 1914. Direction arrow automatically swings with wheel.

1,148,141. TELEPHONE SYSTEM FOR RAILWAY TRAINS; E. H. Boudwin, Philadelphia, Pa. App. filed Nov. 27, 1911. Connections carried by air-brake line.

1,148,142. SIGNALING SYSTEM FOR RAILWAY TRAINS; E. H. Boudwin, Philadelphia, Pa. App. filed Feb. 24, 1912. Wires inside air-brake hose.

1,148,152. ELECTRIC BATTERY; F. S. B. de Mello, Rio de Janeiro, Brazil. App. filed Oct. 23, 1913. Oxysulphide of copper depolarizer.

1,148,157. ELECTROMAGNETIC BRAKE; J. L. Earl, Morgan City, La. App. filed March 2, 1915. When not braking increases traction of wheels on rails.

1,148,184. ELECTRIC-ARC LAMP; W. R. Mott, Lakewood, Ohio. App. filed June 6, 1913. Negative electrode contains precipitated silica with coating of phosphoboric compound.

1,148,189. METAL COATING FOR ARC-LIGHT ELECTRODES; B. Perris, Cleveland, Ohio. App. filed Oct. 25, 1912. Applied in form of powder.

1,148,218. BATTERY TESTER; E. L. Clark, Lakewood, Ohio. App. filed April 26, 1913. Indicates by audible signal or sense of touch.

1,148,221. PROCESS FOR ELECTRICALLY WELDING TURBINE BLADES; S. Z. de Ferranti, Hampstead, London, Eng. App. filed May 14, 1904. Equalizes welding heat.

1,148,224. BATTERY CONNECTOR; P. J. Fitzgerald, Torrington, Conn. App. filed Nov. 10, 1914. Spring-clip construction.

1,148,230. BATTERY DEPOLARIZER; M. E. Holmes, Lakewood, Ohio. App. filed Nov. 22, 1913. Perhydrol of manganese.

1,148,240. SLACK CABLE DEVICE; D. L. Lindquist and D. Larson, Yonkers, N. Y. App. filed March 3, 1911. Electric switch operated by slack and hoisting cable.

1,148,256. SWITCH; J. L. Schureman, Oak Park, Ill. App. filed March 13, 1911. Retarding means for successively operating switches.

1,148,272. ELECTROPLATING APPARATUS; H. Aderer, Bloomfield, N. J. App. filed April 17, 1915. Adjustable electrode supports in series with a lamp rheostat.

1,148,274. ELECTROLYTIC CELL; E. A. Allen, Rumford Falls, and H. I. Allen, Portland, Maine. App. filed Jan. 2, 1914. Improved cell body.

1,148,279. SELF-INDUCTIVE MEANS FOR ELECTRICAL OSCILLATORY CIRCUITS; G. Von Arco and R. H. Rendahl, Berlin, Germany. App. filed Jan. 29, 1910. Fine variation of self-induction is made possible.

1,148,295. ELECTRICAL CONTACT GOVERNOR; W. Deats, Yonkers, N. Y. App. filed Feb. 12, 1910. Fly-ball governor.

1,148,299. CHAIN-SWITCH PULL FOR ELECTRIC LIGHTS; J. E. Eade, Providence, R. I. App. filed Jan. 22, 1915. Insulator section for pull chain.

1,148,319. SELECTIVE SIGNALING SYSTEM; R. N. Hill, New York, N. Y. App. filed Feb. 24, 1914. For train dispatching.

1,148,325. TRACTION METER; J. G. Kyellgren, Brooklyn, N. Y. App. filed March 4, 1912. For indicating consumption of the motor current.

1,148,343. METHOD OF PUNCTURES IN ELECTRIC FLAME-ARC FURNACES; E. Troye, Christiania, Norway. App. filed Aug. 13, 1914. Conducts gas or air streams between furnace lining and cover.

1,148,344. SINGLE TRUCK; B. R. Van Kirk, Philadelphia, Pa. App. filed Dec. 26, 1914. Constructed to prevent longitudinal rocking or "galloping."

1,148,348. ELECTRIC HORN; C. E. Avery, Jersey City, N. J. App. filed Oct. 2, 1911. Diaphragm construction.

1,148,411. ELECTRIC ALARM; R. S. Smith, Columbia, Miss. App. filed Jan. 20, 1914. Connected to lighting circuit and illuminates clock dial.

1,148,436. FIXTURE SUPPORT AND BRACKET; W. R. Blain, Albany, Ore. App. filed March 5, 1915. Adjustable to various positions.

1,148,437. CIRCUIT-BREAKER; H. M. Boal, Corry, Pa. App. filed May 15, 1914. For telegraph system.

1,148,439. TROLLEY-WIRE SWITCH; F. H. Boyle, Champaign, Ill. App. filed Jan. 24, 1913. Prevents discontinuance of current at switching point.

1,148,458. SUBSTATION TELEPHONE; O. M. Leich, Genoa, Ill. App. filed March 15, 1910. Local-battery type.

1,148,465. REFRIGERATING SYSTEM; G. J. Sayer, Chicago, Ill. App. filed Feb. 2, 1914. Automatic control of refrigerant.

1,148,481. CURRENT INDICATOR; J. W. Ryan, Overbrook, Pa. App. filed Dec. 10, 1914. Revoluble member and heater, etc., is magnetically turned to indicate on or off.

1,148,484. CALL BOX; P. A. P. Davis, Baltimore, Md. App. filed June 2, 1913. For selectively sounding different signals.

13,950 (reissue). LIGHTNING ARRESTER; F. S. Chapman, Greensburg, Ind. App. filed July 28, 1914. (Original patent No. 1,104,960.) Vacuum type.